

## THE POWER SECTOR IN: ECUADOR

Issue Area	ECUADOR
<b>I. Current Status of Sector Reform: Key Points</b>	
Power System Overview	Electricity generation in Ecuador was 10,890 GWh in 1998, with an installed capacity of 3,119 MW. The country has an electricity deficit of around 300 MW, and is in need of approximately 150 MW per year of additional capacity to meet the expected demand growth of roughly 7-8%. Electricity coverage is around 79.7% of the total population, with 95.7% coverage in the cities and 54.3% coverage in the rural areas. The system is fully interconnected and operates as a single system, with the exception of the isolated minor systems in the East and the Galapagos Islands.
Structure	The structure of Ecuador's electricity sector changed significantly after the implementation of the new electricity law. The state owned electricity monopoly INECEL has already been unbundled and its assets have been transferred to the new electricity authority CONELEC. INECEL was transformed into six generation companies and a transmission company. The six generation companies will be privatized soon, as well as the government's share in 18 different distribution companies. There is an additional distribution company, EMELEC, which is 100% privately owned and provides service to the city of Guayaquil.
Competition	Competition in the electricity sector in Ecuador has been improved with the vertical and horizontal unbundling of the industry. The establishment of the new wholesale electricity market operated by CENACE will enhance this competitive environment. These companies are still in government hands, which means that real competition will not occur until the companies are privatized. Hidropaute, which owns the Paute Hydroelectric project (1,075 MW), is the largest company in the country, representing more than 50% of the total generation in the country.
Role of the State	The government of Ecuador is currently the largest participant in the electricity industry in Ecuador. Through its Solidarity Fund, it owns the six generation companies and the transmission company derived from INECEL. The Solidarity Fund also owns shares in 18 of the 19 distribution companies that exist in the country. The government is also in charge of policy and regulatory functions through CONELEC. The government is planning, through the promotion of the privatization process, to reduce its participation in the commercial activities. Nevertheless, the current law allows for the privatization of only 49% of the assets, which still leaves the government with a large participation in the sector.
Regulatory Institution	CONELEC is the government agency in charge of regulation and overseeing the electricity sector. It began its operations in November 1997. CONELEC is in charge of granting concessions in the generation, transmission, distribution and commercialization activities. CONELEC is also in charge of the Electrification plan, which is mandatory for the public sector entities and referential for the private sector.
Private Sector Participation	The participation of the private sector in Ecuador is limited. There are some private thermal generators that are increasing their participation in the sector. The distribution company EMELEC is 100% privately owned and provides service to the city of Guayaquil. The plans of the government of Ecuador, following the public services law, is to reduce its participation in the sector through the privatization of the assets that it currently owns, and by promoting the construction of new private projects in the industry.
Major Outstanding Issues	<ol style="list-style-type: none"> <li>1. The privatization process is an important step towards larger competition in the Ecuadorian electricity industry. Current legislation only allows for the privatization of up to 39% of the electricity companies and selling 10% to company employees, leaving the government with a 51% holding in the companies. President Jamil Mahuad has sent a proposal to congress to increase the 39% limit and to end the 10% restriction. This change will likely increase the interest of private companies in the privatization process.</li> <li>2. The slowdown in the country's economy has represented a reduction in the investment rate in the sector. Ecuador has had repeated rationings in the past years, which reflect the under-capacity in the system. The private sector is expected to build this needed new capacity.</li> </ol>

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	3. The new wholesale electricity market has just begun its operations under the administration of CENACE. A close watch should be taken in order to verify its proper operation.
<b>II. Legal &amp; Regulatory Framework</b>	
Legal Basis	<p><i>Electricity Law (Ley Régimen del Sector Eléctrico, LRSE), October 1996.</i> This law substitutes the basic law for electrification and defines the new structure of the electricity industry in Ecuador. This law determines that the provision of electricity service is a public service and the government should ensure its provision. It also permitted the government to delegate the provision of the different commercial activities to the private sector. The law defined the new wholesale electricity market and the roles of CONELEC and CENACE within this new market. It also initiated the unbundling and liquidation process for INECEL, which was finalized in April 1999.</p> <p>Relevant regulations to implement the law include:</p> <ol style="list-style-type: none"> <li>1. Regulation for the Electricity Law</li> <li>2. Regulation for the operation of the new wholesale electricity market</li> <li>3. Regulation of the dispatch and the operation of the national interconnected system</li> <li>4. Tariff regulation</li> </ol>
Role of the State	The government of Ecuador still holds a significant role in all the activities of the electricity industry. Nevertheless, it is willing to move out of the commercial activities and retain the role of regulator and overseeing agent for the industry. For that reason, it is willing to privatize the assets derived from the unbundling of INECEL's activities as well as its participation in the distribution companies. But with the current regulation, the government will still remain as a significant participant in the industry as it has to keep holding 51% of the shares in the privatized companies.
Institutional and Regulatory Entities and Jurisdiction	<p>The <b>Consejo Nacional de la Electricidad (CONELEC)</b> initiated its operations of November 20, 1997. It is in charge of the regulation and overseeing activities for the electricity industry. Through CONELEC, the government has the power to delegate generation, transmission, commercialization and distribution to the private sector through concessions. CONELEC is also in charge of planning activities, preparing the national electrification plan, which is mandatory for the public entities and referential to the private companies. The members of CONELEC's board are representatives of the president, members of the production groups, the electricity workers and the army.</p> <p>The <b>Centro Nacional de Control de Energía (CENACE)</b> initiated its operations in February 1999, as the operator for the new wholesale market. It is in charge of managing the physical and financial operation of the market. CENACE is a non-profit technical private corporation and is formed by the members of the wholesale market, including the generators, the transmission company, the distributors, marketers and large consumers.</p> <p>The <b>Solidarity Fund</b> currently holds the shares of the government on the commercial activities in the sector.</p> <p>The liquidation of the <b>Instituto Ecuatoriano de Electrificación (INECEL)</b> was finalized in April 1999. Various new companies derived from INECEL are already operating under different jurisdictions.</p> <p>The <b>Consejo de Modernización del Sector Eléctrico (COMOSEL)</b> is the entity in charge of implementing the changes in the electricity industry that are mandated by the law. It will be in charge of leading the privatization process of the different electricity companies.</p>
Sector Planning	CONELEC is in charge of the planning activities for the electricity industry in Ecuador. It prepares the Electrification Plan, which is mandatory for the government owned companies and referential for the private companies.

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<b>III. Sector Structure and Participants</b>	
Structure	<p>The current structure of the electricity industry in Ecuador is a result of the restructuring and liquidation of the Instituto Ecuatoriano de Electrificación (INECEL). The company was subdivided into six generation companies and one transmission entity, and its regulatory and dispatch activities were moved into new entities in the sector. There are 19 regional distribution companies in the country, 18 of which are partially owned by the government. The electricity law permits the participation of the private sector in all the commercial activities in the industry. The government expects that most of the needed investments in the industry will be made by that sector, which has already initiated its participation in the generation industry.</p>
Participants and Degree of Private Sector Participation	<p><i>Generation:</i> The six generation companies derived from INECEL currently dominate the generation market in Ecuador. These companies are Hidropaute (1,075 MW), Termoguayas (227 MW), Hidroagoyan (143 MW), Termoesmeraldas (132 MW), Termopichincha (111 MW) and Hidropisayambo (76 MW). The remaining installed capacity is owned by small state companies and by the increasing participation of the private sector in the form of independent producers, self-generators and cogenerators. CONELEC has been active lately in tendering and awarding concessions to the private sector. It has already awarded the concession for the 230 MW San Francisco hydroelectric project to a Brazilian consortium and is in the process of reviewing proposals to build the 160 MW Mazar hydroelectric project.</p> <p><i>Transmission:</i> Transmisión Eléctrica del Ecuador is the newly created transmission company derived from INECEL. It is currently upgrading the national transmission system in preparation for the sale of a stake in the company in the future.</p> <p><i>Distribution:</i> There are currently 19 distribution companies in Ecuador. Eighteen of these companies are share companies, for which the public sector has a majority stake. The 19<sup>th</sup> company is EMELEC, which is 100% owned by the private sector and provides distribution services in the city of Guayaquil. The only one of these companies that is not connected to the national interconnected system is the Empresa Eléctrica Sucumbíos S.A. There are also various small distribution companies in other isolated areas. The largest distribution companies are EMELEC and Empresa Eléctrica de Quito, which represent 31.0% and 23.6% of the market, respectively.</p>
Targets for Privatization	<p>The electricity industry in Ecuador is preparing for privatizing assets in all of its commercial activities. The six generation companies derived from INECEL, as well as the transmission company will be privatized, and shares owned by the government in the distribution companies will also be sold. COMOSEL is in charge of promoting this privatization process. Current regulation only allows for the sale of 39% of the shares in the companies to the private sector and 10% to company employees. The government is working through Congress to increase the 39% and remove the 10% restriction in order to make the projects more attractive to private investors.</p>
New Investments	<p>Most of the new investments in the electricity industry in Ecuador will be performed by the private sector. CONELEC has been active in awarding concessions to the private sector. At the same time, the operation of the new wholesale market and the current conditions of under-capacity represent incentives for the private sector to invest in the country.</p>
<b>IV. Electricity Markets: Areas of Competition and Monopoly</b>	
Bulk Power	<p>Competition in the wholesale power market was improved with the unbundling of INECEL and its entrance into operation within the new market. The new law indicates that no single company can own more than 25% of the total installed capacity in the country and has restricted agreements between companies to ensure competition. Nevertheless, the government is still the owner of the largest generation companies in the country, which deters competition in the market. The large stake that the Paute project represents in the generation market could reduce competition, therefore a close look should be taken as to its operation.</p>
Transmission	<p>The only transmission company in Ecuador is a regulated monopoly, which is obliged to maintain and</p>

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and Distribution (Networks)	expand the transmission network in the country. The distribution networks are also regulated by CONELEC. Both the transmission company and the distribution companies are obliged to guarantee open access to all market participants. They are not allowed to give preferential treatment to any company, and the transmission companies are not allowed to market electricity.
Retail Distribution	Distribution companies have been granted concessions and are the sole providers of electricity for final consumers in their assigned regions. Retail prices are regulated by taking into account the different portions of the rate. Only large consumers can buy electricity from the wholesale market and pay distribution companies for the use of the grid.
<b>V. Load Dispatch and Pool Operation</b>	
Dispatch Entity and Basis	CENACE is in charge of both system and market operation. It began its operations in February 1999 as a non-profit organization, with private ownership. Its board is formed by a representative of the President and by representatives of the generators, the transmission company, the distributors, the marketers and the large consumers.
Pool Operation	The wholesale market is a centralized power pool operated by CENACE. The participants of the power pool are the generators, the distribution companies and the large consumers. The generators in the pool are dispatched based on the demand and their generation costs. Based on this data CENACE calculates the short run marginal costs of the system. Buyers have the opportunity to buy the electricity directly at this cost or to sign long term contracts with generators. These long-term contracts are strictly financial, as the dispatch in the market is not actually based on them.
<b>VI. Pricing</b>	
Bulk Power	<p>There are two kinds of contracts that can be signed between generators and consumers in the wholesale market. The first kind is the one in which distribution companies and large consumers can sign long-term contracts with the generation companies. These contracts are free and should be notified to CENACE in order to liquidate these transactions. In addition to these contracts, generators and consumers are allowed to participate in the spot market, which results in hourly prices. Regardless of the contracts already signed, CENACE performs a dispatch of the system based on the demand and the generation costs of the different units, determining the dispatch of each one of the plants and the short run marginal cost. The plants that cannot fulfill the contracts with their dispatched energy are forced to buy from the spot market at the short run marginal cost. Generators, distributors and large consumers are also allowed to buy electricity directly from the spot market. Energy prices in the spot market are calculated for a specific node, which is called the market node, and are calculated taking into account the merit order of the different generation units. Nodal prices are calculated by multiplying the energy price on the market node by the node factor. Node factors are calculated taking into account the transmission losses that occur between the node and the market node with a variation in the injection or extraction of power from that node.</p> <p>Ancillary services are also remunerated.</p>
Transmission/ Distribution (Networks)	Transmission is paid in two different ways. Large consumers and distribution companies pay for the variable transportation costs, the price charged is based on the node factors. Fixed costs are paid by generators and are regulated to cover the investment costs as well as for the operation and maintenance costs. Generators have to pay a connection fee, which is calculated based on those costs and on its installed capacity.
Retail Tariffs	The prices to final consumers are regulated. The final price is composed of an addition of the generation costs, the transmission costs, plus the value added of distribution (VAD). This value added of electricity corresponds to the normalized costs of a distribution company with similar operation characteristics to the ones of the distribution company. It includes the costs associated to the consumer, which are not related to its demand of electricity and capacity. It also includes the technical losses and the investment, operation and maintenance costs of the reference company. Distribution company will calculate annually this component and send it to CONELEC for its approval.

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Subsidies	<p>In the past the government has subsidized the cost of electricity for residential users, which represent about 40% of the country's demand. These subsidies were cut in September 1998, raising the prices of electricity by 25%.</p> <p>There are still various subsidies in Ecuador, which are based on the principle of equal access of all electricity consumers. Final consumers of low consumption are those who have consumption levels lower than the average consumption for residential users in their specified region. The high consumption residential users will subsidize low consumption final consumers of the same geographic region. There are additional direct subsidies, which are used for rural and urban electrification programs.</p>
<b>VII. Sector Problems and Priorities</b>	
Framework and Other Issues	<ol style="list-style-type: none"> <li>1. The steps already made towards the creation of a more competitive electricity market in Ecuador have significantly improved the conditions in the sector. The unbundling of INECEL's assets and a fully operational wholesale market are proof of these new conditions. On the other hand, the government still owns a majority of the assets in all the commercial activities in the sector. The privatization process should occur as a means of creating companies that are independent from each other. The proposal to change the percentages to be sold to the private sector, to values higher than the current 39%, needs to be approved by the Congress before the government begins the process. However, there could be other means for granting operational management of the companies to the private sector, which could initiate the privatization process with the currently allowed 39%.</li> <li>2. CONELEC has been effective in implementing the new tariff structure, awarding concessions, and publishing the national Electrification Plan. Nevertheless, due to its recent creation, a close watch should be taken to its evolution, to determine its independence from the government and its maturation as a regulatory and overseeing agency.</li> </ol>
Operating Needs	<ol style="list-style-type: none"> <li>1. Ecuador has had repeated electricity deficits of around 300 MW per year. This has resulted in lengthy rationings and imports from Colombia, mostly during the dry season, when the Paute project is not able to provide enough energy to the system. The government has been unable to perform the needed investments due to the lack of funds, which were marked by the recent financial crisis, and by the lack of effective planning. The restructuring of the sector is seen as a move of the government to reduce this deficit by promoting investments from the private sector.</li> <li>2. The government intends to improve the transmission grid in order to make the privatization of the transmission company more attractive.</li> </ol>
Electrification and Energy Efficiency	<p>In 1994, INECEL financed a study prior to the creation of a "Program for Administration of the Demand and Efficient use of electricity"(AD&amp;UREE). This feasibility study shows that a program such as AD&amp;UREE could reduce the power requirements by 238 MW in the country by the year 2010, with a savings of 422 GWh/year from a minor investment of 1% to 2% of the total revenues of the distribution companies. Even though the benefits are large, the program has not been implemented yet.</p> <p>Following the Electricity Law, distribution companies should present to CONELEC the electrification program for their respective regions. These programs are financed with the resources of the Fund for the Electrification of the Rural and Urban Marginal Areas (FERUM), which is administered by the Solidarity Fund. Based on the amount of funds provided by FERUM, CONELEC approves those programs and sends the funds to the distribution companies. This program is expected to incorporate new systems to the grid and to provide electricity service to 20,000 new families per year.</p>

**Sources**

Consejo Nacional de la Electricidad (CONELEC), 1998. "Plan de Electrificación del Ecuador, Período 1998-2007".

**Relevant web Pages:**

Centro Nacional de Control de Energía (CENACE): <http://www.cenace.org.ec>

Consejo Nacional de la Electricidad (CONELEC): <http://www.conelec.gov.ec>

US Energy Information Agency (EIA): <http://www.eia.doe.gov/>

Catholic University of Chile: <http://www.ing.puc.cl/~power/southamerica/southamerica.htm>