

Guatemala Energy Planning: Model for Sustainable Development and Economic Growth

Ministry of Energy and Mines

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This is a proposal document pursuant to the communication DIGRIME-POLEC 13700108216/GRC from the Secretariat of Planning and Programming (Segeplan, by its acronym in Spanish) to the Office of the Ministry of Energy and Mines, urging to submit projects under the Forum for East Asia – Latin America Cooperation (FEALAC), using the applicable registration form. This proposal is being transferred on the date indicated, in the form required, translated into English as requested by the Ministry of Foreign Affairs. It has been email to polec@minex.gob.gt and cooperacion@minex.gob.gt.

Title	Guatemala Energy Planning: Model for Sustainable Development and Economic Growth		
Working Group	Cooperación, Socio Política y Desarrollo Sostenible	Country	Guatemala
Date	Julio 2016	Venue	
Project Status (Choose one)	<input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation <input type="checkbox"/> Reformulated		
Project Category (Choose one)	<input type="checkbox"/> Consultation by Specialists <input type="checkbox"/> Short Term Training Course / Internships <input checked="" type="checkbox"/> Workshops / Seminars <input type="checkbox"/> Networks <input checked="" type="checkbox"/> Database <input type="checkbox"/> etc.		
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Participants	Member Countries		
	Organizations	Ministry of Energy and Mines	
Project Purpose & Description	<p>Introduce the strategic actions that Guatemala has promoted in the past five years in developing the energy sector, mainly in energy planning putting the country into a "model of sustainable development of the energy sector at regional level", as it ensures electricity supply to the Guatemalan population with a long -term vision; in addition to expanding access to this basic service with quality at affordable prices, which have remained stable over the last 5 years, through strategic actions such as promoting a balanced energy matrix regarding technology generation.</p> <p>This energy development model has also allowed to place Guatemala as the leading exporter of electricity at the level of the Regional Electricity Market (MER, by its acronym in Spanish). Guatemala plays a proactive role, currently holding the Pro Tempore Presidency of the Council Director of the Regional Electricity Market, where advocates for the diversification of the energy matrix towards renewable sources. Guatemala also urges other MER's countries to work together in strengthening the capacity of installed transmission of the Regional Electric Interconnection System. The country works on the viability for underwriting long-term contracts on the purchase and sale of energy from Guatemala; on the review and adjustment of the legal framework governing the operation of the electricity market, aiming to enhance the institutional and transparency in order to ensure proper governance and alignment of decisions of the organs of the regional electricity sector towards the comprehensive goals of an adequate market development.</p>		

Activity Description & Outcome	<p>OBJECTIVE: Introduce the set of factors and strategic actions that the country has made in order to meet a State Energy Planning, which have enabled Guatemala have competitive advantages at the regional level regarding the purchase and sale of electricity and the provision of this basic service with quality at stable prices for the Guatemalan population.</p> <p>Methodology and Outputs:</p> <ul style="list-style-type: none"> - The theme will be developed through presentation (PPT format) allowing to answer questions or receive feedback at the end of the presentation. - To establish a network of technicians from the energy sector of the participating countries to share, in the short term, knowledge, skills, methodologies, actions, among others, regarding short, medium and long-term energy planning. - The country's advances in energy planning will be positioned, allowing the sharing of lessons learned from Guatemala's energy sector development. - Guatemala's interest shall be communicated in promoting the Asian investment to strength the electricity transport system, through the upcoming launch of the Expansion Plan of National Transmission 2016 (PETNAC, by its acronym in Spanish). - Also attract investment that will be required in the process of strengthening the Electric Interconnection System of the Region.
File	ATTACHED

Guatemala Energy Planning: Model for Sustainable Development and Economic Growth

Description of Proposal

Introduce the strategic actions that Guatemala has promoted in the past five years in developing the energy sector, mainly in energy planning putting the country into a "model of sustainable development of the energy sector at regional level", as it ensures electricity supply to the Guatemalan population with a long-term vision; in addition to expanding access to this basic service with quality at affordable prices, which have remained stable over the last 5 years, through strategic actions such as promoting a balanced energy matrix regarding technology generation.

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Objective

Introduce the set of factors and strategic actions that the country has made in order to meet a State Energy Planning, which have enabled Guatemala have competitive advantages at the regional level regarding the purchase and sale of electricity and the provision of this basic service with quality at stable prices for the Guatemalan population.

Methodology and Outputs:

- The theme will be developed through presentation (PPT format) allowing to answer questions or receive feedback at the end of the presentation.
- To establish a network of technicians from the energy sector of the participating countries to share, in the short term, knowledge, skills, methodologies, actions, among others, regarding short, medium and long-term energy planning.
- The country's advances in energy planning will be positioned, allowing the sharing of lessons learned from Guatemala's energy sector development.
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Presentation of the Proposal:

The country provides the conditions for supplying energy to benefit Guatemalans and populations of the region. It is a country surprisingly fulfilled with natural resources, which should be exploited better as they are able to generate significant amount of energy, a territory consisting of mountain systems, full of large rivers capable of generating more than 6,000 MW of clean energy, besides, the potential of the volcanic region (1,000 MW), strong winds (20,000 GWh) and sunlight (5.3 KWh / m² / day or 200,000 TWh); with which renewable energy may be generated.

It also has a robust and stable regulatory framework, created in 1996, which is based on an open access model, a competitive market regarding generation and trading, through a cost system that reflects free balances from supply and demand, resulting in conditions of effective competition, and in those segments, in which the presence of economies of scale lead to the existence of natural monopolies such as transmission and distribution, prices are set by the regulator entity on the basis of efficient economic costs.

The generation takes place in a free and competitive environment consisting of an opportunity market based on a release at a short-term marginal cost and a contract market where agents and large users freely agree the conditions of their contracts regarding terms, amounts and price. Transmission and distribution are regulated activities.

The legal framework of the electricity sector is governed by the General Electricity Law, Decree No. 93-96, its regulations and amendments; Regulation of Wholesale Market Administrator, its rules and amendments; Law on Incentives for the Development of Renewable Energy Projects, Decree 52-2003 and its regulations; among others.

The legal certainty sustains the pillars of a secure investment in the country since this legal framework has not been subject to modifications despite the socio-economic and political context of the country.

Energy Policy 2013-2027

In order to strengthen the conditions that Guatemala needs to become more competitive, efficient and sustainable in using and exploiting resources, in 2013, the Ministry of Energy and Mines officially launched the Energy Policy 2013-2027, consisting in the update of the Energy Policy to respond to national, regional and global trends, from a State perspective, aiming the conservation of national strategic reserves, meeting needs and technological development; and taking human development as a fundamental pillar of the policy.

The Energy Policy 2013-2027, promoted by the government of President Jimmy Morales, through the Ministry of Energy and Mines, is aware of the importance of energy as an engine of development of the country, prioritizes the use of clean energies, environmentally friendly for domestic consumption; also encourages interagency dialogue to allow manage democratically social and economic development initiatives, seeking to ensure a comprehensive view in its implementation, monitoring and evaluation.

The policy's follow-up taken in Guatemala has achieved a permanent electricity service with quality at stable prices, prioritizing respect for the environment and communities where projects are developed. Therefore, Guatemala has accomplished in the past 4 and a half years, stability in the prices of electricity, reducing energy generation tariffs by up to 30%.

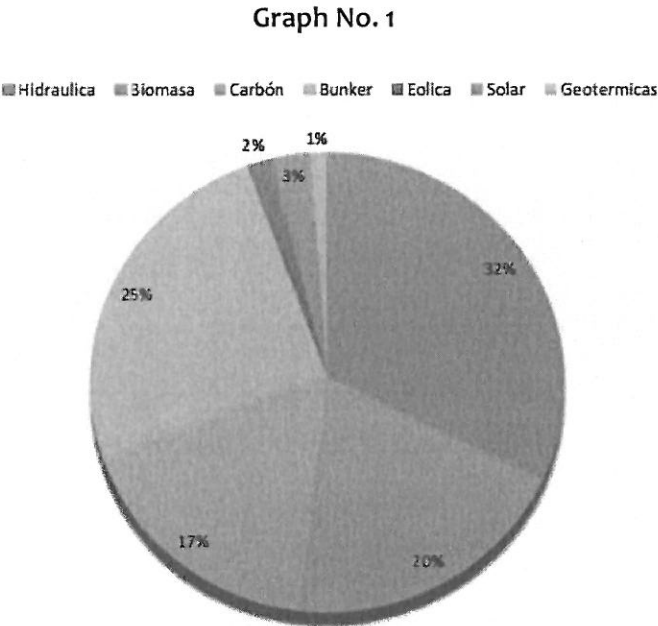
Among the policy advances stands out the national electricity coverage rate at 90%. In 2020 it is expected to exceed 95.20% through the expansion of the coverage of transmission networks of the National Interconnected System (SNI, by its acronym in Spanish).

In Guatemala, national energy consumption corresponds to 34% from oil, 57% from firewood and 9% from electricity. This 9%, which relates to the electricity consumption, is supplied with energy produced by 23.92% through hydropower, 33.98% through

bagasse, 22.42% through carbon, 14.07% through bunker, 2.78% through geothermal, 1.61% through solar energy, 1.16% through wind and 0.06% through biogas.

The axes of the current energy policy are the use of 80% of renewable natural resources of the country, promoting technologies for energy efficiency, saving 30% in energy by 2027 in public institutions of government through the formation of energy efficiency committees and reducing greenhouse gases.

In addition, a study led by the Ministry of Energy and Mines, showed that by 2015 the energy matrix behaved as follows:



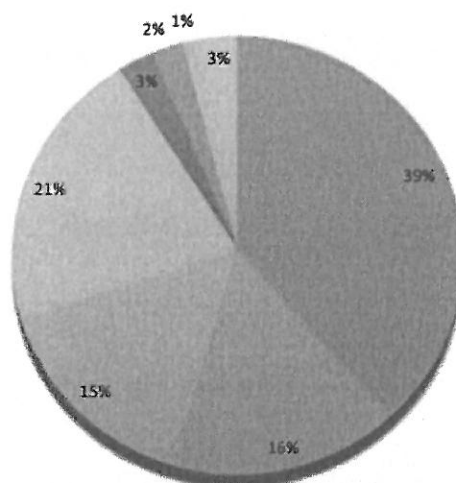
Fuente: Elaboración propia, con datos de la PLP del AMM, Septiembre 2015

Source: Own elaboration based on PLP from AMM (Asociación del Mercado Mayorista), September 2015

Through energy planning, it was possible to determine the behavior of the matrix of power generation by 2030, resulting in:

Graph No. 2

■ Hidraulica ■ Biomasa ■ Carbón ■ Bunker ■ Eolica ■ Solar ■ Geotermicas ■ Gas Natural



Fuente: Unidad de Planeación Energético Minero.

Source: Unit of Mines and Energy Planning

Indicative Generation and Transmission Plans

The Indicative Expansion Plan of the Generation System 2016-2030 has been mainly based on the focus of the Energy Policy 2013-2027, in the axes related to the supply of electricity security at competitive prices and saving and efficient use of energy. The latter axe contains concrete actions which lead to a decrease in demand, but indicative projects are necessary to address the decline scenarios.

Expansion Plans also consider scenarios for the implementation of actions that enable the development of generation through different technologies, suggesting the participation of generation plants, to be shipped in the medium term.

The general objective of the Indicative Expansion Plan of the Generation System is to promote investment in electricity generation prioritizing the use of renewable energy and reducing the costs of electricity supply in terms of investment and operation while minimizing the impact on the environment of CO₂ emissions.

Contributing regional energy integration, and considering generation from international interconnections in the economic evaluation and optimization, attracts

investment to provide the necessary services for the construction, implementation, operation, maintenance and logistics of fuel supply for different power plants.

Expansion Plan of the Transportation System 2016-2025

In recent years, Guatemala has made efforts to expand the energy transportation system to increase reliability and improve the quality of supply, minimizing the frequency and duration of failures (general or partial brownouts), matching the network to a mesh topology (ring formation) since currently has a radial topology.

Attempts to encourage investment in new power generation based on renewable resources, which are far from major load centers, bringing the transmission system, which is the beginning of the transformation of the energy matrix in Guatemala.

In 2014, the Open Tender PETNAC-2014 was held, which was aimed at the construction of transmission infrastructure which incorporated the design, construction, creation of easements, supervision, operation and maintenance for 50 years. The value of canon awarded for the service of electricity transmission was \$ 33,278,153 and included the construction of a 546 km transmission line, 21 new substations and 19 extensions.

The Expansion Plan of Transportation System 2014-2023 raises a number of needs and objectives to be met pursuant to energy requirements of the population in economic, social, technical and environmental criteria, taking into account previous expansion plans and the updated Energy Policy, which the Ministry of Energy and Mines has established.

Therefore, the Ministry of Energy and Mines, aware of the importance of the use of energy for the country's development and based on its role as governing body of the energy sector, will soon be calling on investors interested in the Expansion Plan of the National Transportation (PETNAC 2016), with which it will be supporting the expansion of energy transportation system at different voltage levels.

Among the main objectives of PETNAC 2016 are: 1) To fulfill the objectives of the Energy Policy 2013-2027; 2) To increase the rate of rural electrification to 95% by 2027, defined in the Energy Policy; this will improve the rate of electrification in the departments that currently have the lowest electricity coverage: Alta Verapaz, Petén, Quiché, Baja Verapaz and Izabal. Therefore, reliability, quality and security of electricity supply by reinforcements in existing networks of transmission will be increased, resulting in improved quality rates in the distribution network and within the standards established in the regulations.

To develop the PETNAC 2016, electrification of the country, as well as power demand and unmet and non-supplied energy within the country were taken as premises; the timing of the entry of the generation plants obtained in the Expansion Plan 2016-2030 was analyzed. An important examination is the investment cost in the transmission works, previous expansion plans of the transportation system, power quality supply rates, the results of the quality survey, long-term goals established in the Energy Policy in 2013-2027 and ongoing projects PET-1-2009 and PETNAC 2014.

Regional Electricity Market

The Regional Electricity Market (MER, by its acronym in Spanish), formed by the Central America countries, represents a great opportunity for economic development in the region. Guatemala is a leader in energy exports to the MER. Only in 2015, Guatemala injected 65% of trade, being the country that obtained the most surplus from transactions.

This market has a regulatory and institutional structure that has been strengthened and developed. Its regulatory structure includes a Framework Agreement signed by the countries; besides protocols, regulations and resolutions.

Regional bodies that compose the MER are: the Regional Commission of Electrical Interconnection (CRIE, by its acronym in Spanish) as regulator; The Regional Operating Agency (EOR, by its acronym in Spanish) as operator of the market; and the Steering Committee of the Regional Electricity Market (CDMER, by its acronym in Spanish) as an organ of politics, which currently, Guatemala occupies the Pro Tempore Presidency.

CDMER was created by the Second Protocol to the Framework Treaty in order to facilitate the compliance of the countries' commitments; and is responsible to drive the development of MER taking the necessary decisions to achieve the objectives and comprehensive purposes of the Treaty and its protocols.

CDMER is constituted with political representatives from the energy sector from each country of the region. From July 2016, Guatemala holds the Presidency of CDMER.

Guatemala has prioritized among its energy matters, to continue supporting the development of the Regional Electricity Market. In this regard, as part of their energy planning and as the Presidency the country holds, advocates and urges other region

countries and partner countries to promote the attention to an agenda with three main objectives:

- a) Develop an Appellate Mechanism so that MER agents have more strengthened institutions which will ensure adequate transparency and certainty in decision-making of MER's regional bodies.
- b) To promote the construction of national reinforcements, which will enhance internal transmission lines, necessary to adequately exploit the transmission capacity of the SIEPAC project.
- c) Develop regulatory mechanisms to make real the long-term contracts in the Regional Electricity Market.

Guatemala promotes joint actions with the Government of the United States of America and Mexico, in order to support the eventual interconnection Mexico-Regional Electricity Market, which represents an opportunity for Guatemala and other MER's countries, to buy and sell electricity at better prices.

CONCLUSIONS AND FEEDBACK

- ✓ Nowadays, Guatemala enjoys a satisfying and safe supply for generation, which allows the country to export power to the region, and continues to seek opportunities to reduce costs for the benefit of the national economy.
- ✓ The national strategy implemented in recent years may be summarized as: transparency, continuous and stable order from legal certainty scope that provides to the investor.
- ✓ The Ministry of Energy and Mines, as part of energy planning, checks and monitors the reliability of power systems to take action in an efficient way, in order to improve the electricity transport system and to contribute in reducing losses and thereby promote actions for reduction in the emission of greenhouse gases.
- ✓ Through hydrothermal measurement in the country, which uses operational studies of short, medium and long term, the Ministry of Energy and Mines calculates the least-cost operating policy in order to maximize and reduce generation costs in Guatemala.
- ✓ With the calculation of various economic ratings such as the marginal cost of operation, rates of "toll", the costs of network congestion, water values per plant, the marginal cost of fuel among other things, Guatemala's energy sector is gradually strengthened.
- ✓ Guatemala has strengthened its capabilities to perform long-term planning and to predict when it will be necessary to hire new plants; predict the estimated price of energy and power generation for each plant, among other predictions, focusing on the supply and stability of electricity price at nationwide.