Wind Power Projects in Honduras and its Applicable Legislation

Mr. Emilio Alvarenga
MSc. Student
Barent´s Environmental Engineering
(Orientation, Sustainable Energies)
University of Oulu/Narvik University College

Mr. Sakari Eskelinen
Master of Laws, Master of Social Sciences
S. Eskelinen Environmental Law Expertise Ltd
Windpowerlegal

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Glossary

BOE – Barrel of Oil Equivalent

CDM – Clean Development Mechanism

CNE – National Energy Commission

DECA – National Directorate of Environmental Assessment and Control

DGE – National Directorate of Energy

ENEE – National Electrical Energy Company

EEP – Energy and Environment Partnership Program

GsT – GeoSpatial Toolkit SWERA

GT – Gas Turbines

GWh – Giga Watt Hour

HSDP – Half Speed Diesel Plants

IIE – Electrical Research Institute of the Mexican Ministry of Energy

JI – Joint Implementation

LMSE – Legal Framework of the Electrical Subsector

LPG – Liquefied Petroleum Gas

MW – Mega Watt

OLADE – Latin-American Organization of Energy

PPA – Power Purchase Agreement

PNUMA – United Nations Environment Programme

SERNA – Ministry of Natural Resources and Environment

SIN – Interconnected National System

SWERA – Solar and Wind Energy Resource Assessment

TWh – Terawatt Hour

UNAH – National Autonomous University of Honduras

W – Watt

Contents

Introduction

The following report includes an insight of Honduras potential in terms of wind power generation and its related environmental and energy legislation. The work has been elaborated in co-operation with Mr. Sakari Eskelinen [(1)], a Finnish Wind Power legislation expert lawyer.

Recently, studies have been carried out in order to evaluate the conditions and project operation of this unlimited natural source. The biggest wind power park in Central America has begun its construction with a 100 MW power output in a municipality located 25 km south from Tegucigalpa (Honduras capital) [(2)].

The first section of this report will describe the Honduran electrical system and the energy consumption per subsector in order to illustrate the situation of the nowadays power production and consumption. Consequently, as a result of the implementation of renewable energy technologies, the country might obtain a positive and sustainable outcome in terms of clean electricity production and the decrease in conventional fossil fuels use. In addition, the regions of particular importance for the wind energy projects development will be mentioned and depicted as well.

Secondly, there are small scale renewable energy co-operation projects between Finland (Ministry for Foreign Affairs) and Honduras. In spite of the authors of this report interest concerning all forms of sustainable energies, the focus is rather for wind power projects and its applicable legislation in Honduras. Nonetheless there are several renewable energies projects within the previously mentioned co-operation that will be briefly described in Section 2.

Thirdly Honduras wind power potential will be illustrated in terms of the wind classes all over the Honduran territory. Nonetheless strong emphasis is done on the drawback conditions from which significant environmental and technical limitations have been consequently found.

Fourthly, the legislation framework is included in this report in order to establish a clear picture of the legal process that must be carried out according to the Honduran legislation. Thus there are several permits which are issued by different authorities as well as an environmental impact assessment compulsory process.

Nevertheless, there are important challenges that must be overcome although an important power production and contribution to the different subsectors of the Honduran electrical system could be obtained. Hence, those issues will be analysed in this report from different perspectives in order to vision a wind power yield scenario within the future nearby.

1. Section 1: Description of the Honduran Interconnected Electrical System

1.1. Generators [3]

According to the National Electrical Energy Company (ENEE), the total installed capacity of the generators in 2010 was 1,610.29 MW. This amount of energy is divided in 28.80% (464.4 MW) which are provided by hydropower plants owned by ENEE, 7.70% (124.60 MW) from thermal plants owned by ENEE as well, 59.60 % (959.30 MW) from private thermal plants, 3.80 % (61.99 MW) from private hydropower plants and 5.70% (91.40 MW) from private biomass plants.

The following table depicts in detail the installed capacity for the production of energy in the different types of power plants. In Honduras the mechanical devices utilized for the generation of thermoelectricity are:

- Water and gas turbines (GT)
- Half speed diesel plants (HSDP)

Power Plant Type	Power (MW)	Percentage (%)
Hydraulic state-owned	**464.40**	**28.80**
Thermal state-owned	**124.60**	**7.70**
HSDP	91.60	0.00
GT	33.00	0.00
Private plants	**1,021,29**	**63.40**
Hydraulic	**61.99**	**3.80**
Thermal	**959.30**	**59.60**
HSDP	828.40	51.40
GT	39.50	2.50
Biomass	91.40	5.7
Total	1,610.29	***100.00***

Table 1: Installed capacity of power generation in Honduras 2010

One relevant aspect about the power production in this country is that wind energy power generation and its applicable technology is not contributing to the electricity generation system yet in the context of wind farms. Nonetheless an important potential exists and it will certainly represent an advantage in order to significantly reduce the production of energy via conventional methods like for instance with fossil fuels.

Unfortunately around 60% (61.6 %) of the electricity could be produced in thermal plants. On the other hand, 38.2% might be yielded from renewable sources. Thus, an unbalanced situation is taking place towards an increase in greenhouse gases emissions and the evident government purchase for expensive energy sources due to the variations in oils derivatives prices. In Honduras there is not oil reservoirs, nor refineries, therefore diesel, gasoline, bunker, kerosene, LPG among other fuels have to be imported.

In 1994, there was an opposite scenario in which 70% of hydropower generation and 30% of electricity produced in thermal plants. The government introduced an incentive,

Legislation Framework of the Electrical Subsector (LMSE) by for the inclusion of the private sector in the generation of electricity [4] in order to invest in the subsector. However, the technology implemented by the private sector was the thermoelectric diesel plant because it was, by that time cheaper, with a low risk, short term installation, with profitability and environmental assessments were not required, fixed costs were covered by ENEE and finally because of the swift investment recovery. Therefore the energy sales of the private sector in 1995 were 882.7 GWh and in 2007 they reached 4,310.8 GWh. This situation represents an increase of 488% [5].

1.2. Energy Sources and Electricity Consumption [6]

According to Honduras energy balance in 2007 (See Annexe A), there is a high dependence on hydrocarbons in the commercial category. The biggest consumer subsector is the transportation (43%) followed by the electricity generation (33%) and the industry consumption with 19%. The following figure illustrates the facts mentioned before.

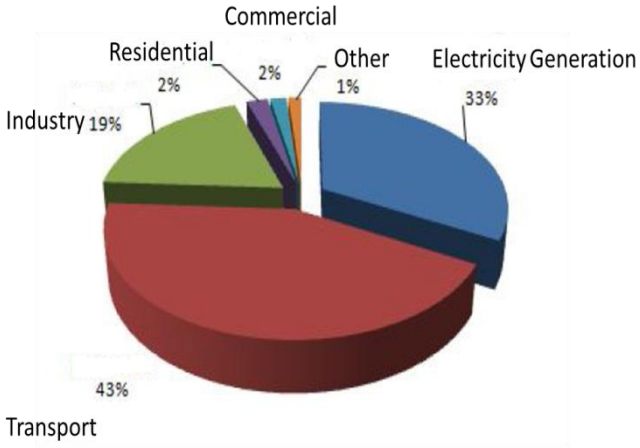


Figure 1: Hydrocarbon Consumption by Subsector

The final consumption of energy throws another important fact in the energy balance. There is 41.2% for the firewood and 20.5% for the diesel. The first one is due to its high residential use and its low efficiency (5 to 10%) as well. Even though it represents a primary fuel, it is not used in industry or handicraft economical activities. On the other hand, diesel consumption is strongly related to the production of electricity as described before.

Coal and coke are utilized in the construction sector specifically in the cement industry. Kerosene has been consumed in the residential subsector for cooking and lighting (rural areas).

Liquefied petroleum gas (LPG) has a low consumption in the residential subsector because of the irregularities in the energy market attributed to the electricity assistance or benefit given by the Honduran government. In addition, the LPG net distribution presents a tremendously bad condition and the consumers are sceptical towards LPG´s risks.

As a result of this analysis, a low level of industrial development is taking place in Honduras as a consequence of the high consumption in the residential sector followed by the commercial one. The electricity benefits produce this negative scenario due to the low electricity price about which Honduran families do not have efficient electrical energy consumption. Thus low efficiency equipment's are used like for instance, electric stoves rather than LPG based.

The following figures illustrate the information mentioned in the previous paragraphs.

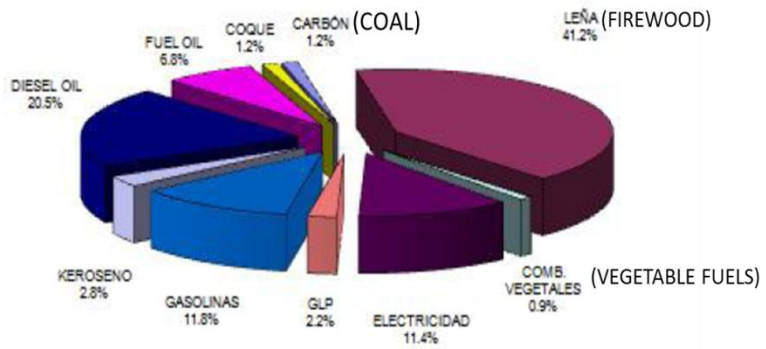


Figure 2: Energy Final Consumption

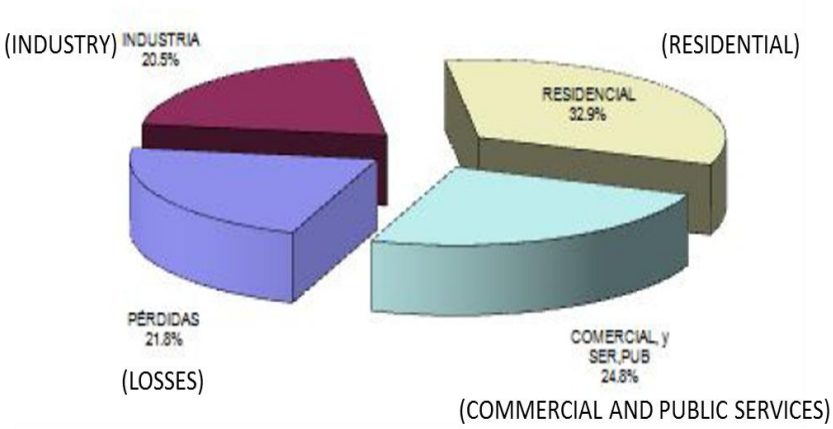


Figure 3: Electricity Consumption per Subsector

2. Section 2: Finland´s cooperation for renewable energy projects in Honduras [7]

The Energy and Environment Partnership Program (EEP) constitutes an initiative of the Finnish government to promote renewable energy, energy efficiency and clean technologies investments in different selected program regions or countries. The EEP has begun in 2002 during the Unites Nations World Summit on Sustainable Development. Since 2003 Finland has contributed with a total of 7MEUR and in addition the Austrian government has allocated 1,8 MEUR to the public financing of the partnership.

The EEP is nowadays on its third phase and it involves the participation of public and private sector, NGO´s and community organization; all of them considered as stakeholders. Therefore the objective of the EEP is to enhance partnerships between all the stakeholders whether they are local, regional and/or international.

There are several projects covered by the EEP funds in the Honduran territory. Those could respectively be observed in Table 2 [8].

Project Name	Status
Rational and Sustainable Use of Firewood through the Construction of Ecological Stoves for Rural Communities in Amarateca Valley	Finished
Feasibility Study for the Usage of Alternative Fuels (Municipal Solid Waste) at the Cement Plant CENOSA	Finished
Solar Pumps for Sustainable Agriculture	Finished
Study and final designs for hydro generation La Presa	Finished
Solar pumping for sustainable agriculture	Finished
Bioethanol	Finished
Jatropha Curcas Plantation in Honduras	Finished
Strategic Environmental Assessment for the development of biofuel production projects	Finished
Using biodiesel in a segment of the public transportation	Under Execution
Solar technologies as compensation for environmental services	Finished
Feasility study waste to energy in Puerto Cortés, Honduras	Under Execution
Project of Biodigestor in the Negrito, Yoro	Finished
Implementation of Efficient Furnaces " Many " and " Right " Echo Furnaces in sixty families who dedicate to the production and commercialization of artisan ceramics in the Municipalities of Ojojona and Santa Ana, Department of Francisco Morazán	Finished
Hydroelectric Project San Martín, Honduras	Under Execution
Construction of ecological furnaces in communities of the Park Nacional Patuca and its zone of influence	Under Execution

Project Name	Status
Hydroelectric project Chinacla Department of Intibucá, Honduras	Under Execution
Feasibility study for a project of Eolic electrical generation in Honduras. Additional evaluations	**Contract in Signature**
Renewable qualification, investigation and promotion on energias in the farming and forest sector of the Central American region	Under Execution
Photovoltaic Energy like platform for the development of poor and vulnerable families in the south of Honduras?	Under Execution
Mini Hydroelectric power station Guinean River like supplier of Clean Energy in countryside with environmental, social and economic benefits in its area of influence.	Under Execution
Substitution of traditional stoves by Eco-stoves Justa	Elaborating contract
Clean energy for the Public Health	Under Execution

Table 2: EEP renewable energy projects in Honduras

***It is relevant to mention for the purposes of this report, that there is in La Esperanza Department of Intibucá, one wind power park feasibility project covered by the EEP funds*.**

In addition, four small scale hydropower projects have been identified in Honduras for Finland´s Clean Development Mechanism/Joint Implementation (CDM/JI) pilot program. The first registered CDM project in the world was Rio Lindo hydropower plant (32 GWh per year in average) [(9)]. Therefore significant efforts driven by the Finnish government have remarkably positive impacts in the reduction of greenhouse gases emissions in the Honduran territory. Furthermore, those initiatives represent the guidance for the Honduran authorities in order to switch to a mainly renewable energy matrix.

3. Section 3: Wind Power Energy in Honduras

In Honduras there has been one study carried out in order to estimate the country´s wind energy potential. That one is respectively the Wind Atlas in the framework of the PNUMA:SWERA project [(10)].

3.1. Wind Power Potential [(11)]

Wind measurement in Honduras has been done only for agro-meteorology and airport purposes. Although there are many institutions, like for instance the Ministry of Natural Resources and Environment (SERNA) and National Autonomous University of Honduras (UNAH), and several decades of wind speed records, the measurement devices did not have a maintenance plan. Some of them have stopped functioning and were as a matter of fact, never calibrated. The heights of those instruments were between 5 and 10 m.

The National Directorate of Energy (DGE) encouraged in 1997 a measurement campaign in order to solve the measurement issue and to have record of the wind speeds with energy related purposes. In 1997, DGE started relations with the Electrical Research Institute of the Mexican Ministry of Energy (IIE) to establish an agreement in order to have a calibration campaign and the relocation of the anemometers available. Nevertheless, the agreement was never applied by the Honduran authorities.

Latin-American Organization of Energy (OLADE) carried out a study for the wind classification with energy purposes in the Central American region based on the preparation of wind charts and the information from the existing meteorological stations in every country as well.

Until January 2008, there were 15 stakeholders' applications in SERNA for the use of the wind power resource (see Table 3). Their objective is to execute the profitability study of those electricity generation projects. Some of them have based their application on the previous information provided by the SWERA project.

Application Year	Name of the Project	Company	Location	Power Estimated
2001	Honduras 2000	Empresa Eoloeléctrica Zond de Honduras S.A. de C.V.	San Buenaventura y Santa Ana, Department of de Francisco Morazán	60 MW
2004	Eólico Clipper	Clipper Energía Eólica de Honduras	Santa Ana y San Buenaventura, Department of Francisco Morazán	60 MW
2004	Eoloeléctrico La Tablazón	Corporación Colibrí Esmeralda, S.A. de C.V.	El Tablón, Department of Comayagua	20 MW
2004	Sociedad International Ligth-Power Corp. (ILPCO)	Eólico Cerro de Hula	Santa Ana, Ojojona, Department of Francisco Morazán	49 MW
2004	Electrotecnia S.A. de C.V.	Eólico Calaire Chinchayote	San Marcos De Colon, Apacilagua, Concepción de María y El Corpus, Department of Choluteca	12 a 18 MW
2005	COMTEMPO SA	Proyecto Eólico Guarita	Municipios De Guarita, Cololaca, Tomala, Department of Lempira	15 MW
2005	Fuentes de Energía Renovable de Honduras S.A .de C.V. (FERSA)	Proyecto Eólico Sur	San Buenaventura, Department of Francisco Morazán	42 MW

Application Year	Name of the Project	Company	Location	Power Estimated
2005	Energía Eólica De Honduras S.A. (Mesoamérica)	Honduras 2000	Cerro de Hula, Department of Francisco Morazán	100 MW
2006	Grupo Vientos La Peña, S.A. de C.V.	Parque Eólico Vientos La Peña	San Marcos De Colon, Department of Choluteca	10 MW
2006	Sociedad Rota Inversiones	Proyecto Eólico Granja De Los Olivos	Márcala, Department of La Paz	15 MW
2007	Inversiones Energéticas S.A. de C.V.	Eólico de Occidente	Department of Ocotepeque	100 MW
2008	Electrotecnia S.A. de C.V.	Proyecto Eoloeléctrico Chinchayote	San Marcos de Colon, El Corpus, Concepción de María, Apacilagua, Choluteca	15 MW
2008	Vientos de Yamaranguila S.A.	Eólico Vientos de Yamaranguila	Yamaranguila, Intibucá	15 MW
2008	Vientos del Pacifico S.A.	Eólico Vientos del Pacifico	Choluteca, Choluteca	60 MW
2008	Eólicos R4E S.A. de C.V.	Parque Eólico el Chinchayote	San Marcos de Colón, Choluteca	50 MW

Table 3: Wind Power Project Studies [12]

The first measurements in Cerro de Hula were taken in 1994. This a high wind power potential place located 25 km south from Tegucigalpa and 1 km away from the transmission lines. According to SWERA, its power density is between 500 and 800. This is a project in which the highest viability and profitability are justified with the presence of wind speed Class 6 (see Table 4). However there were some legal issues with other companies that have delayed the project. Fortunately, those problems were solved in 2007. The company who is developing the project, Mesoamerica Energy has signed on the 6th of October 2007 a purchase-sale agreement with ENEE for an installed capacity of 100 MW. According to this contract, ENEE will buy the total amount of power produced by the wind park. Thus the greenhouse emissions will be reduced and the oil dependence as well. The Honduran government created an incentive for the development of this wind power project with the issue of the Legislative Decree 09-2001 and the Executive Decree PCM 16-2008. Furthermore, the electricity generation by renewable sources has an incentive through the Legislative Decree 70-2007 in which there are tax exoneration and attractive prices. The contracts and licenses are granted for 50 years.

Wind Class	Potential	Power Density of Winds at 50 m (W/m^2)	Wind Speed at 50 m (m/s^2)
1	Poor	0-200	0-5.6
2	Marginal	200-300	5.6-6.4
3	Moderate	300-400	6.4-7.0
4	Good	400-500	7.0-7.5
5	Excellent	500-600	7.5-8.0
6		600-800	8.0-8.8
7		> 800	> 8.8

Table 4: Wind Class and their Potential

The outcomes of the SWERA project in terms of wind power potential indicate the regions of particular importance for project development. Those could be found in the department of Francisco Morazán (central region) specifically in the municipalities of Ojojona, Santa Ana and San Buenaventura. In the south (Choluteca and Valle) and the south-western (La Paz, Lempira, Intibucá and Ocotepeque) side of the country, Class 7 winds have been detected. In addition there are Class 3 and Class 4 winds in the Honduran Caribbean Sea (off-shore potential). Nonetheless, the Mesoamerican Reef Barrier which goes through Honduras [(13)] northern coast would represent the most important challenge for the wind power parks project development in terms of the environmental impact assessment.

For the off-shore wind turbines, the noise has to be taken into account. The aquatic mammal behavior can be affected in the construction phase or during plant operation time. Powerful under water sound waves could lead to physical hearing impairment if there is a strong source of noise in the vicinity. However the impact assessment related to this issue has to take into account natural background noise and additional sources of sound such as the ones that might come from ships [(14)].

The base infrastructure of the wind mill is built over a concrete foundation. Previous dredge and fill steps are required though. There is the construction of underwater electric cable as well. Logically, effects might be expected. However their intensity and extent depend on the structure of the foundation and the amount of materials (cable length) transferred to the bottom of the underwater site. During the construction phase, sedimentation of solids and the increase in turbidity of water may significantly affect fish populations. Wind turbine structures may also affect the hydrology of the area by changing the local flow conditions [(15)].

All of those habitat changes might lead to the decrease in breeding and animal feed availability for the fauna underwater. On the other hand, the opposite phenomenon could occur by attracting fishes to the structures (new habitat) [(15)].

Especial attention is required in the design of the cable connection net to the wind farm. This is due the fish shoal movements that could easily be restricted [(15)].

Approximately, there are 9,447 km^2 (8.4%) of the country surface with some potential for wind power generation. Wind distribution and its location in the Honduran territory can be observed in Figure 8. There are places though in which the wind power potential is low like

in the departments of Gracias a Dios, Colón, Olancho, northern Comayagua and western parts of Francisco Morazán. This is the route followed by the Trade winds in Honduras and it ends in the southern region where there is an important potential as mentioned before.

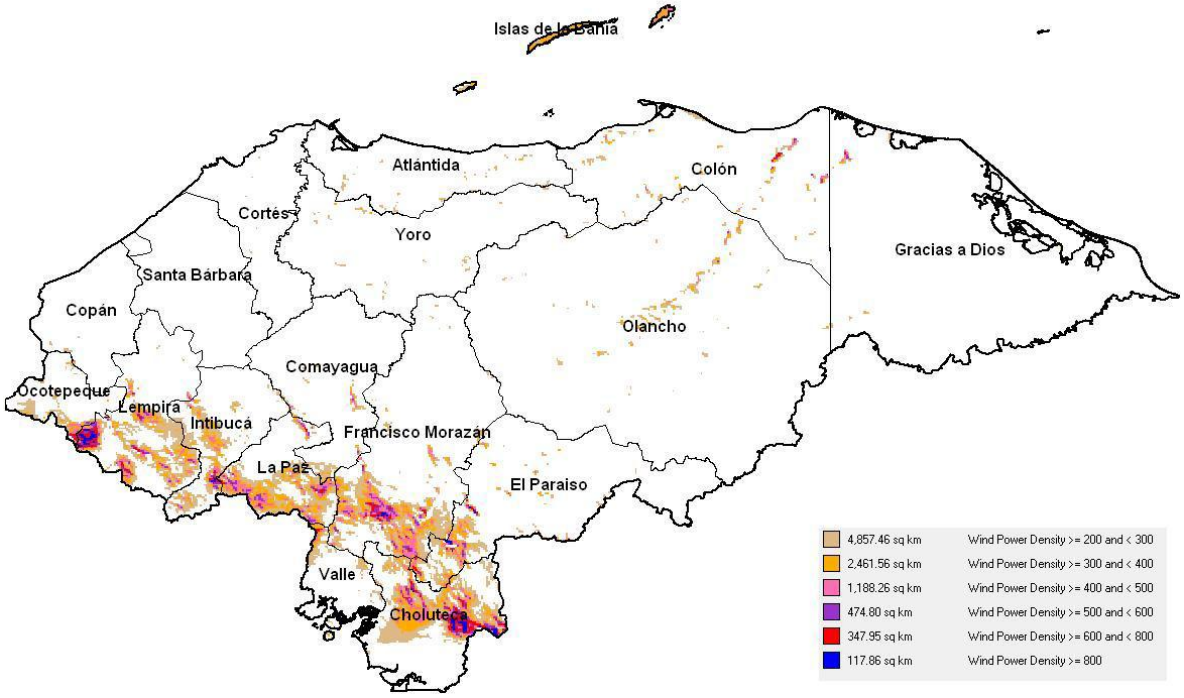


Figure 8: Theoretical Wind Power Potential Density

The theoretical wind power potential estimated in Honduras by the GsT (SWERA project) is 46,660.10 MW. The toolkit takes into account wind speeds from Class 2 to Class 7 and the protected areas potential is included as well. In order to get the real wind power potential, the first step would be the subtraction of the possible wind power generation in inaccessible and protected areas from the total plausible value. Thus the new amount would be 43,517.20 MW. Figure 9 illustrates this fact.

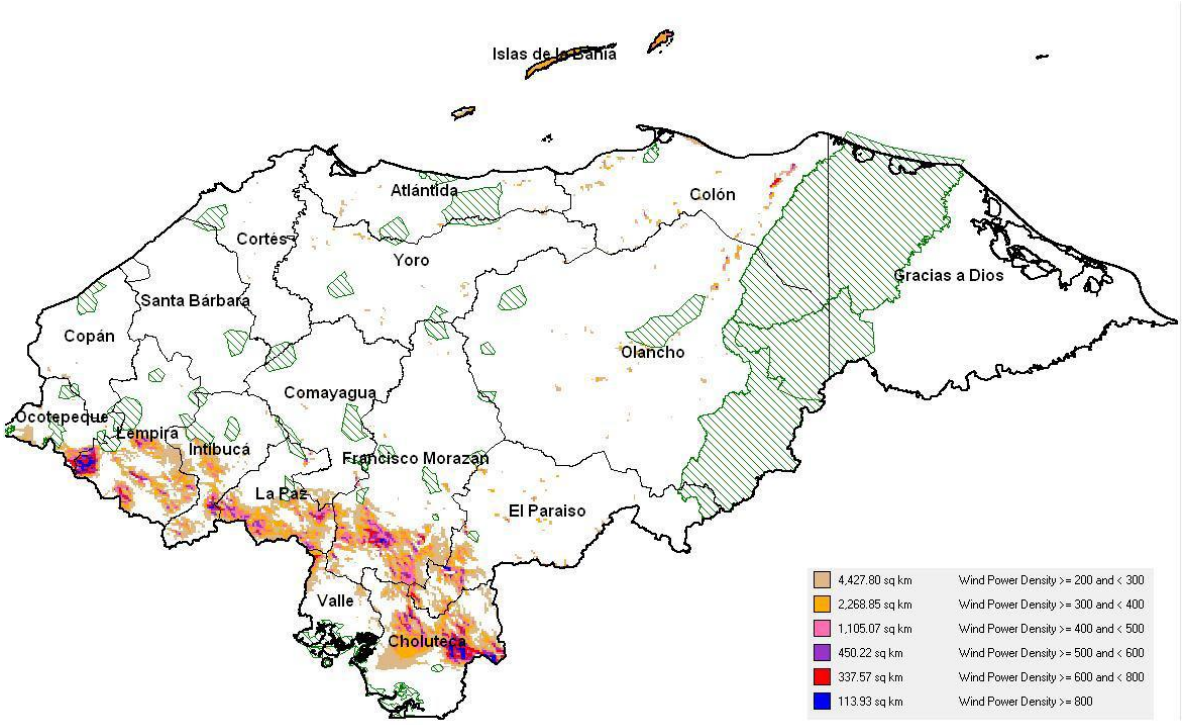


Figure 9: Wind Power Potential Density and Protected Areas

One of the main technical aspects in the design of a wind power parks is the minimum wind speed that starts the rotation of the blades (generator). It is actually very important for the capacity factor of the production plant. Thus the blade designers take into consideration the small wind speed changes. In order to illustrate the pervious situation from the Honduran potential point of view, a scenario with wind speeds from Class 5 to Class 7 could be established. This particular situation reduces the potential available from 43,517.20 MW to 3,948.9 MW. The previous case is shown in Figure 10.

The national grid is included in Figure 10 and it can be observed that the southern western region in which there is a high potential, has the lowest electrical energy coverage index (See Annex C) and the lowest human development indicator of the country. Consequently, the government must improve the road and transmission line infrastructures in order to increase the viability and profitability of wind power projects (See Annex B). Figures 11 and 12 include 2 possible scenarios in which wind speeds from Class 3 to Class 7 are considered. On the other hand, distances of 10 and 25 km from the wind power source to the grid and the closest road have been taken into account as well.

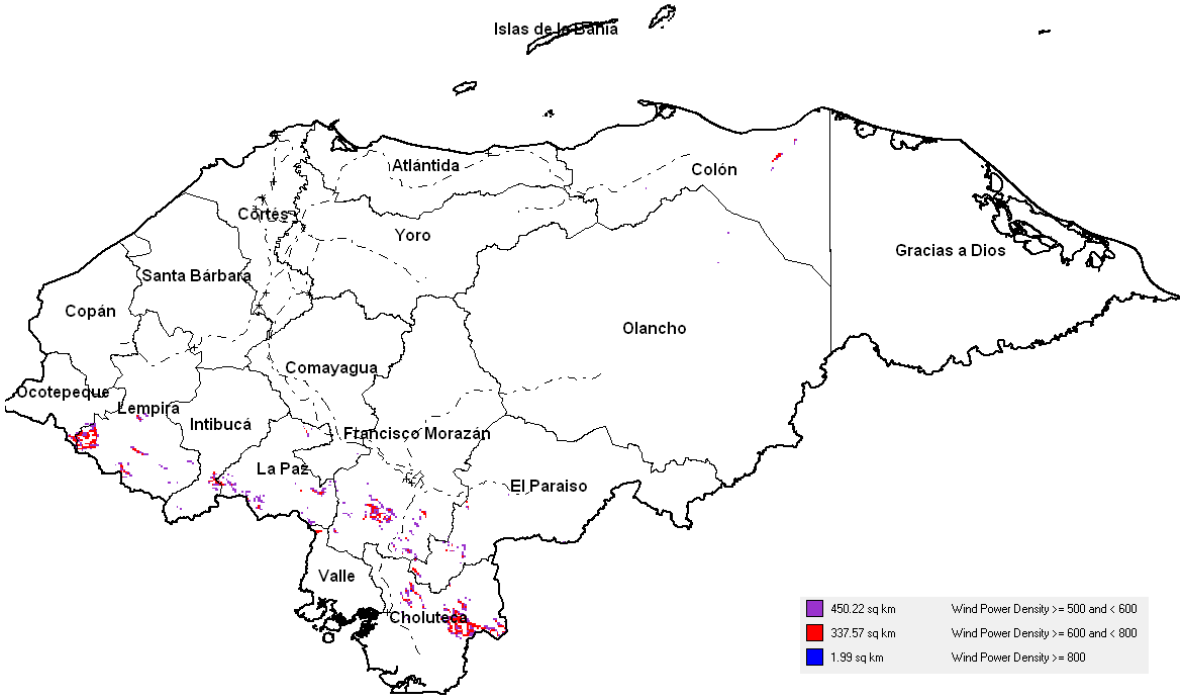


Figure 10: Wind Power Potential for Wind Class 5 or Higher

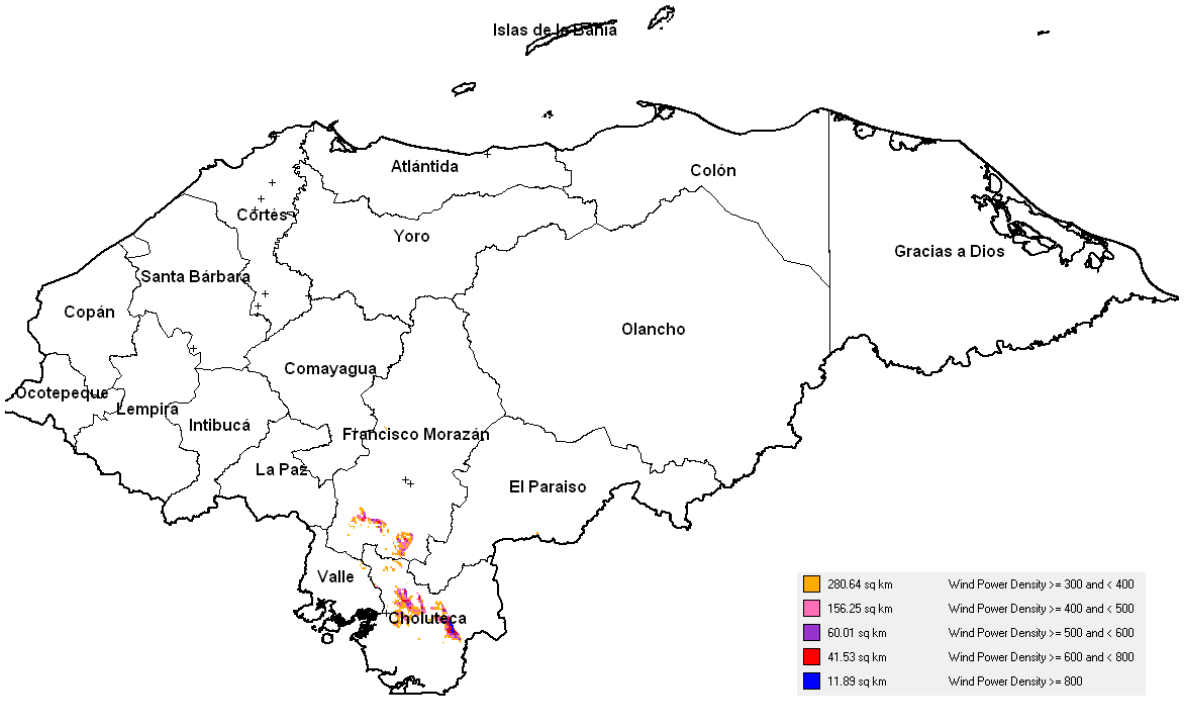


Figure 11: Wind Power Potential (Class 3 to 7) 25 km away from the Grid and the Access Road

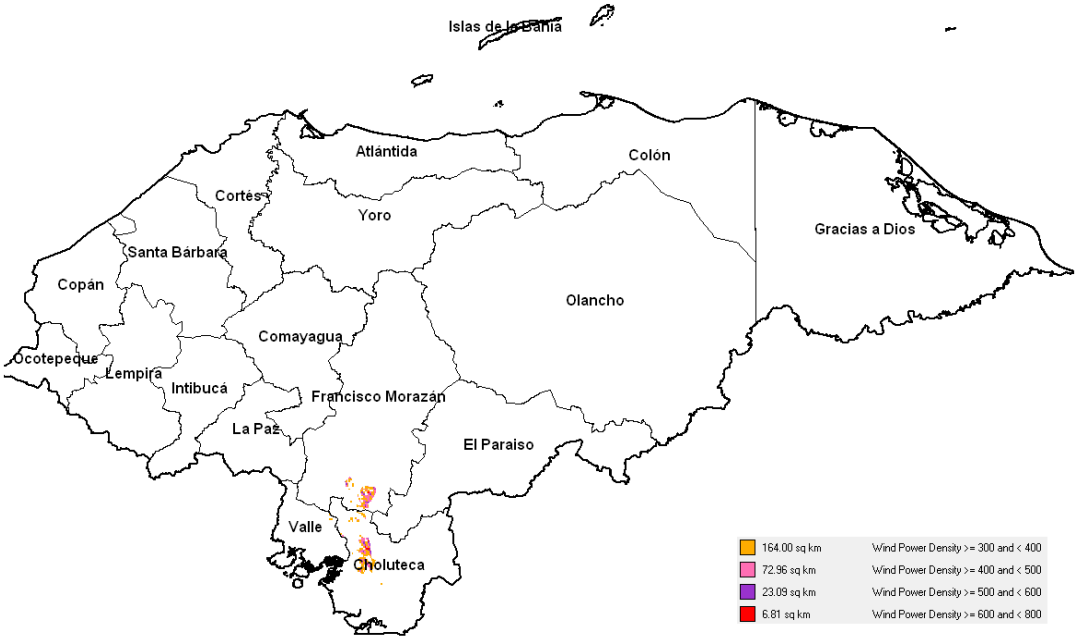


Figure 12: Wind Power Potential (Class 3 to 7) 10 km away from the Grid and the Access Road

All the possible scenarios described before can be summarized in Table 5.

Conditions for the estimation of wind power potential	Power (MW)						
	200 to 300	300 to 400	400 to 500	500 to 600	600 to 800	More than 800	TOTAL (MW)
Theoretical Potential	24,287.30	12,307.80	5,941.30	2,374.00	1,779.75	589.3	47,239.45
Available Potential	22,139.00	11,344.25	5,525.35	2,251.10	1,687.85	569.65	43,517.20
Potential of wind speed Class 5 to Class 7				2,251.10	1,687.85	9.95	3,948.90
Potential 25 km away of the grid and the access roads		1,403.20	781.25	300.05	207.65	59.45	2,751.60
Potential 10 km away of the grid and the access roads		800	364.8	115.45	34.05		1,334.30

Table 5: Wind Power Potential in Honduras Estimated from Different Scenarios

The Central American wind power potential can be observed in Figure 13.

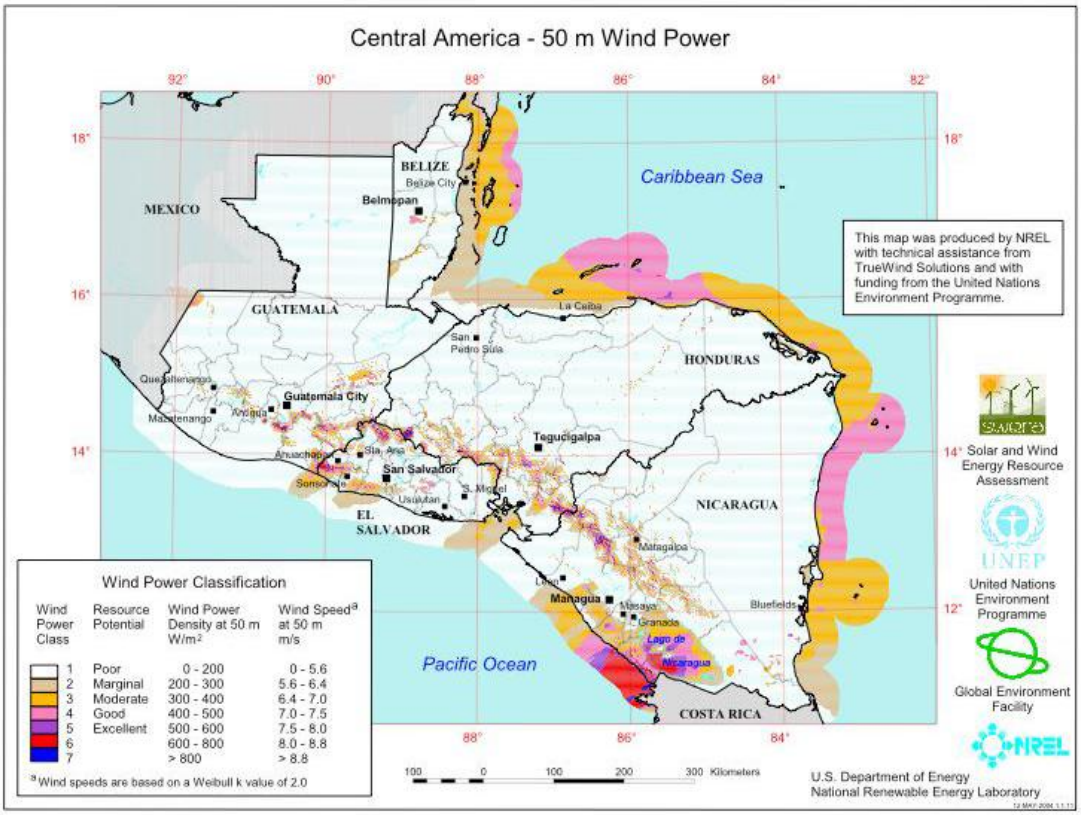


Figure 13: Wind Power Potential in Central America.

3.2. Applicable Legislation to Wind Power Parks

3.2.1 Relevant Considerations [16]

In the Central American region there is actually an interesting and remarkably important complementarity between hydropower and wind energy production. In the dry season when the hydropower potential decreases, the wind blowing regime increases nonetheless. Thus in Honduras, non-conventional mechanisms of electricity generation could be alternated according to the season in order to maintain an electricity yield all year round. However further developments in a higher wind speed range are required for delivering steadily power to the Interconnected National System (SIN).

Generally the three main environmental impact categories for the construction of wind parks in Honduras (including the selection of the site and the wind mills assembly) are: visual impact in the landscape, risk of bird collision and the noise produced by the mill components.

In Honduras the government authority responsible for the renewable energy projects grants and permits is SERNA. Consequently, this institution represents an intermediate

through which regulation and technical standards are emitted for its direct applicability in the energy sector. On the other hand, the National Energy Commission (CNE) is in charge of the compliance with the national legislation framework within the entire electricity sector. This government entity was created under the decree 131-98 in 1998. One of the main duties of this commission is to assess and judge all the legislation projects related to energy production. It is important to mention that CNE is part and completely dependent of SERNA and its members are chosen by the President of the Republic. Nonetheless those are previously suggested by SERNA.

There are several significant changes introduced in the energy sector legal framework. This is related to the fact that there was an energetic crisis in the time frame from 1990 to 1996. All the agreements and decrees implemented in the Honduran legislation can be observed in Table 6 [17] [18]. Therefore as an outcome of the increasing interest growth of the private sector, the Renewable Energy legislation is consequently suggested and implemented by October 1998.

Decree Number	Issued by (Authority)	Description	Publication Date in the Official Gazette
Agreement 934-97	Presidency of the Republic	Regulation of the Electrical Subsector Legislative Framework*	June 1997
Decree 158-94	National Congress	Electrical Subsector Legislative Framework*	November 1994
Decree 163-93	National Congress	Incentives for Forestation, Reforestation and Forest Protection	March 1993
Agreement 1039-93	Presidency of the Republic	Regulation of the Forestry Chapter (Decree 31-92)	July 1993
Decree 31-92	National Congress	Modernization and Agricultural Sector Development Law	April 1992
Decree 194-84	National Congress	Hydrocarbons Law	October 1984
Agreement 1276	Presidency of the Republic	Regulation of the Hydrocarbons Law	-
Decree 131-98	National Congress	Incentive Law for the Production, Competitiveness and Support to the Human Development*	April 1998
Decree 283-98	National Congress	Promotion and Development of Public Works and National Infrastructure Law	January 1999
Decree 267-98	National Congress	Reforms to the Decree 85-98	October 1998
Decree 85-98	National Congress	Public Utility Statement for the Development and Production of Energy from Renewable Sources*	April 1998

Decree Number	Issued by (Authority)	Description	Publication Date in the Official Gazette
Decree 45-2000	National Congress	Partial Reform of the Decree 267-98*	May 2000
Decree 70-2007	National Congress	Development and Production of Energy from Renewable Sources Law, consolidation and update of the Decree 85-98´s incentives*	October 2007

(*): Regulation related to the production of renewable energy.

Table 6: Reforms introduced to the Honduran energy sector legal framework

All the activities in the Honduran territory related to the production, transmission, distribution and commercialization of the electrical power are regulated by the LMSE (Decree 158-94 and Agreement 934-97). Its applicability involves all the legal and natural entities; public, private or mixed organizations that might have any participation in the activities previously mentioned. Therefore the main target is to provide incentives to the private sector for its immediate involvement in the electricity generation. On the other hand those legal instruments promote to sell as well the distribution systems which have been so far owned by ENEE, to any citizen, municipality or cooperative.

The Decree 85-98 is fundamentally based on sustainable development principles and the significant Honduran potential in terms of the renewable energy sources. Hence it is certainly expected to protect the environment as well as to potentially reduce greenhouse gases emissions.

3.2.2 Permits and Licenses for Wind Power Projects in Honduras [19]

The sequence of permits and licenses required for Wind Power projects in Honduras are:

1. Permit for the project´s viability study
2. Environmental license
3. Operation contract (permit)
4. Electricity supply contract (permit)
5. Municipal building permit

The electricity supply contract does not represent a real permit in this process. Nevertheless is treated similarly due to the fact that the agreement is established with ENEE which is the only electricity purchaser in the country.

3.2.2.1 Permit for the project´s viability study

This procedure is known officially as the “Viability Studies Permit for the Construction of Energy Generation Infrastructures through National Renewable Natural Resources”. A

business association is exclusively authorized to carry out the studies in the valid time frame. This is applicable as well for the further development of the project as along as the Operation Contract and remaining requirements are fulfilled.

The application of the permit is done through the DGE and SERNA. There is the involvement the Secretaryship of the SERNA as well.

Requirements and characteristics of the application

The application can only be carried out by a business association as previously mentioned. There are actually only a maximum number of three applications that can be executed by a business association for energy generation purposes. The application would be denied in case that the business association has already a valid permit or a previous application in process.

The expected process completion could be around 6 months. However it is highly dependent on several project factors like for instance the quality and clearance of the information submitted, the complexity of the development, the disputes that might occur for a particular site among other aspects.

This procedure is required for all the renewable energy projects except for cogeneration and self-supplied projects.

Application Outcome

If the permit is granted, it is valid for 2 years and it could be renewed for 2 years as well (once more). Nonetheless it could be revoked if the studies have not started in a time frame of 12 months.

After the grant of the permit, the applicant will carry out the technical and financial viability studies. Hence the Operation Contract could be then processed. The developer would have to complete the studies in the time frame established and would submit three-month period reports of the developed activities progress to the DGE according to the activities chronogram presented in the application.

A summary of the requirements, process and application outcome can be observed in the following Table 7.

Requirements	Processes	Application Outcome
- **Background and experience of the developer** - **Identify the project and its chronogram** - **Financial information**	- Checking that there is no any overlapped permit or valid Operation Contract (DGE) - Field visit (DGE) - Legal report	- Permit granted for carrying out the studies (the completion of the studies must be done in the time frame established and three-month reports must be submitted to the DGE)

Table 7: Summary of the application process for the Viability Studies Permit

3.2.2.2 Environmental License

This process consists on presenting all the project information required to the relevant authorities. Thus the objective is to obtain a certificate that states the compliances of all the requirements according to the valid legislation. The Honduran legislation requires that each energy generation project has to go through this process. There is actually a classification of the projects and it will be depicted further in this document. According to their category (1, 2 or 3) and before to start the project´s works, the respective authority can extend an Environmental License, an Environmental Authorization or a Certificate of Environmental Register.

In addition the Environmental License process is a prerequisite for the signing of the Operation Contract and the Power Purchase Agreement (PPA) as well.

The Environmental License process also involves the assessment of socio-economic aspects such as:

- Affectation of neighboring populations
- Existing Services Infrastructure
- Archeological and Cultural Patrimony
- Productive Activities
- Change to the soil due to its use

Furthermore a certificate with all the environmental and social mitigation or compensation measures that the projects must eventually fulfill in the future could be included in the process as well.

In general terms, the authority in charge of the Environmental License process is the National Directorate of Environmental Assessment and Control (DECA) of SERNA and the proceedings are done through the Secretaryship of SERNA. However, there are cases in which a valid delegation agreement exists between SERNA and the site Municipality where the project is carried out. Therefore the project applicant must address to the Municipality in order to start the Environmental License process. According to SERNA, there are nowadays valid agreements with the Municipalities of Puerto Cortés, San Pedro Sula and Distrito Central.

Requirements and characteristics of the application

The requirements of the Environmental License process are depending on the category of the project. The classification is defined in the Regulation of the Environmental Impact Assessment System in compliance with the changes introduced in Articles No. 5 and No. 78 of the General Environmental Law.

Table 8 depicts the renewable energy project´s classification according to their technology.

Type of Project	Category 1	Category 2	Category 3
Hydropower	≥0.5MW and ≤1MW	>1MW and ≤3MW	≥ 3 MW
Wind Power		≥5MW	
Photovoltaic	≥0.1MW		
Biomass		≥3 MW	
Geothermic		≥5 MW	
Thermal Plants		≥0.5MW and ≤1MW	>1MW

Table 8: Project Classification in compliance with Agreement No. 635-2003 published in the Official Gazette 4-Nov-20036

According to the previous Table the Wind Power projects with an installed capacity ≥5MW are part of category 2. Those have "a medium impact or some large impacts entirely predictable. According to the individual characteristics of any type of project, mitigation or compensation standardized measures could be utilized as long as the projects are located in previously inspected or identified sites (suitable for that kind of activity)". The type of license required for this case is the Environmental Authorization. This authorization is accompanied with a Mitigation Measures Contract that will include standard measures and probably some particular measures according to the authority´s judgment.

The permit application for category 2 projects takes approximately 8 months (estimations carried out by experienced project developers). Thus it is advisable for the applicant to consider this time frame in his planning.

The Financial Equilibrium and Social Protection Law (2002), establishes a cost for the environmental license process according to the total investment of the project. It has consequently to be paid at the end of the process right before the permit´s grant. The costs are (in compliance with Article 5 of the previously cited Law):

- For total investment up to 200 000 Lempiras, 1% of the investment made.
- For total investment higher than 200 000 Lempiras and up to one million Lempiras, 0.5% of the investment made.
- For total investment higher than one million Lempiras and up to twenty millions Lempiras, 0.05% of the investment made.
- For total investment higher than twenty millions Lempiras, 0,02% of the investment made.

This payment covers a valid license period of 2 years. A renovation of the permit could be given after this period with a cost of 50% of the one established in the table which is calculated according to the total investment made till the renovation´s date.

A summary of the requirements, process and application outcome for category 2 projects can be observed in the following Table 9.

Requirements	Processes	Application Outcome
- **Application, Letter, Power, Sworn Statement** - **Qualitative Environmental Assessment** - **Title Deed** - **Association Setting-up** - **Local Authority´s Certificate**	- DECA´s Technical Report - Technical Report, DECA´s Director - Dossier Signature, SERNA´s General Secretary - Ministry's Resolution	- Granting of the Environmental Authorization (the payment has to be done before this step) - Mitigation Measures Contract

Table 9: Summary of the application process for the Environmental License

Application Outcome

As it has been already mentioned for the projects Category 2, the application outcome is the Environmental Authorization.

3.2.2.3 Operation contract (permit)

This is the official document which authorizes the project´s company to operate as an electrical subsector intermediary. According to the Electrical Subsector Legislative Framework, the Operation Contract will be a stipulated period within 10 and 50 years (the period is defined according to the project´s period).

In this procedure there are several departments of SERNA involved and the CNE as well for the review and the final report of the process. Those steps will be depicted in the next section.

Once the Operation contract has gone through several processes of review, analysis and possible modifications, it certainly ends with the Ministry´s and the legal representative of the applying business association´s signature. However if this Contract has a term over the presidential period in which it has been signed, it must be submitted to the National Congress for its approval as a Republic Law. It must be afterwards ratified for the Presidency of the Republic and finally it is applicable once published in the Official Gazette.

Requirements and characteristics of the application

Once the Viability Study is approved, the SERNA´s General Secretary informs the legal representative of the applicant company that an Operation Contract proposal must be delivered to SERNA (in a term no longer than 3 months).

The Contract proposal must have a Project´s Maintenance Warranty for a monetary amount of US$ 800 for every MW of installed capacity of the project.

The dossier of the Contract and Warranty Proposal is analyzed by the DGE, from whom the approval and if necessary possible modifications may come.

Then the DGE submits the dossier to the SERNA´s General Secretary, who transfers it to the CNE for its assessment and modifications if required.

The following step is to return the dossier to the SERNA´s General Secretary for its signature by the legal representative of the applicant business association and SERNA´s Ministry.

The granting of the Environmental License is a prerequisite for the signature of Operation Contract.

As previously described, this permit is not valid until its approval in the National Congress, its ratification by the Presidency of the Republic and its publication in the Official Gazette.

This procedure is estimated to last a term of 12 months.

Application Outcome

The approval of the Operation Contract represents the beginning of the procedure for the PPA with ENEE as further described in section 2.2.2.4 of this report.

The following Table 10 describes a summary of the Operation Contract process.

Requirements	Processes	Application Outcome
- **Viability approved (SERNA)** - **Contract and Warranty Proposal (legal representative)** - **Application containing proof of:** i. **Land rights** ii. **Installations design** iii. **Company legally constituted and registered in the trading company**	- DGE reviews the Contract and Warranty Proposal. It approves or modifies them - The General Secretary sends the Contract and the Warranty to the CNE for its assessment and modifications if required - The Contract and the Warranty come back to the General Secretary for the Ministry and applicant´s legal representative signature - Documents sent to the Republic Presidency and then to the National Congress as a Law Project for its approval - Presidential Sanction and Publication in the Official Gazette	- Granting of the Operation Contract - Formal Maintenance Warranty - Starting point of the PPA with ENEE

Table 10: Summary of the application process for the Operation contract (permit)

3.2.2.4 Electricity supply contract (permit)

This permit is known as the PPA and it makes official the commitments and duties between the producer and the seller of the energy and the purchaser. In the case of Honduras, there is only one electricity purchaser (ENEE).

The PPA is written by ENEE´s Legal Department in a base format contract. Before its signature, the document is reviewed by the CNE and then it is presented to the ENEE´s Management Council about which SERNA´s Ministry is the president; for its further approval. Once the contract is approved, it is signed by the legal representatives of ENEE and the applicant company. The PPA is afterwards submitted to the Republic Presidency and then presented to the National Congress as a Law Project for its approval. Once it is approved by the National Congress it must receive the Presidential Sanction and it is certainly applicable after its publication in the Official Gazette.

Requirements and characteristics of the application

The PPA can only be processed once the Environmental License and the Operation Contract are granted. In addition as previously mentioned, the approval of the National Congress is required as well as the Presidential Sanction and its publication in the Official Gazette.

Generally this procedure last approximately 8 months. However it could last longer because several complex steps are involved: contractual agreement, several institutions reports and finally the process of legislative approval and presidential sanction. There are cases in which the process has lasted over a year.

There are 2 possible mechanisms in which a power producer can sell energy to ENEE:

- Every developer who has been granted with all the required permits has the right, according to the LMSE, to request a PPA to sell energy to ENEE as long as the tariff offer is equal or less that the Short Term Marginal Cost (CMCP). For the projects which generate with renewable sources, there is a tariff bonus of 10% over the CMCP value for the first 10 years index linked in a yearly basis to the United States of America devaluation. The base tariff is fixed according to the CMCP for the year´s signature of the PPA.

- Additionally, ENEE could bid the purchase of energy. In this case, the bidding conditions will eventually define the tariff and the conditions of the PPA as well. However this procedure is not described in detail in this report.

The contents of the PPA are elaborated by ENEE and the CNE with a standardized terms base. Nonetheless there is flexibility for considering suggestions from those concerned such as the project developer and the Honduran Association of Renewable Energy Small Scale Producers (AHPPER) according to the project particularities such as technological characteristics and financial institution requirements.

For renewable energy projects for less than 50 MW of power generation the maximum validity term of the PPA is 20 years. On the other hand, for those projects for more than 50

MW or including flood control elements (hydropower) the maximum validity is 30 years. (According to Decree 70-2007)

Application Outcome

The product of this procedure is the Power Supply Contract which is valid and applicable after its publication in the Official Gazette.

3.2.2.5 Municipal building permit

This building permit represents the instrument which allows the Municipal Authorities to guarantee that the constructions or infrastructures are complying with the security requirements and the applicable legal standards. The constructions must be adapted to the urban development and land demarcation planning

According to the Municipalities Law, the building permits in their territory are issued in fact by the Municipalities.

Requirements and characteristics of the application

All the municipalities have the authority of define the procedure and the requirements for the permits issue. However, the main requirements are generally the presentation of the construction plans signed by a registered professional and the payment of the taxes.

The cost of the procedure represents a percentage established in the Municipal Decision Plan, over the monetary amount of the construction.

Even though this term last over a variable period depending on the Municipality, a reasonable intermediate term is from 1 to 2 months.

There is not a unique procedure defined for the application of this permit.

Application Outcome

For this permit the outcome would be the granting of the Municipal Building Permit.

Conclusions

Even though Honduras is a country with a tremendous wind power potential among other renewable energy sources, there are important challenges to overcome in terms of the improvement of the electrical transmission and road infrastructures. There are 14 wind power projects delayed because of this fact. The authorities could reduce the amount of license and permit procedures in order to find more incentives for the investment in non-conventional energy generation technologies. Nevertheless the lack of economic resources of the stakeholders who actually have the license grant and all the permits required would in any case represent the most important challenge.

The Legislative Decree 70-2007 is one of the incentives that have been created and it provides many opportunities with attractive prices. On the other hand, in 2010 the government carried out a tender process in which ENEE committed to purchase 250 MW of renewable energy from the production of wind, biomass and hydro power plants [(20)]. However the alternative and environmentally favorable technologies are going to have a slow development in Honduras although there is high interest for wind power production unenhanced by the government's bureaucracy.

Annexes

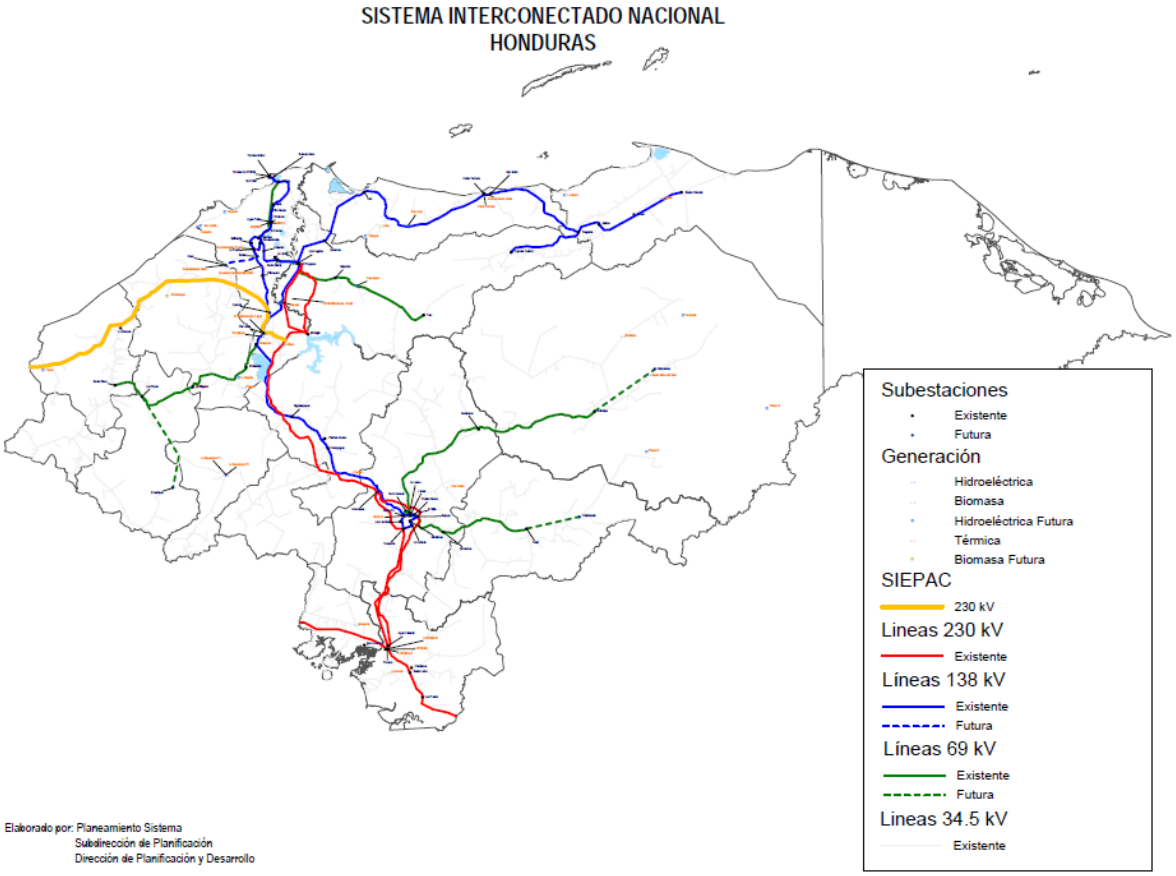
Annex A

Honduras Energy Balance in 2007 (Thousands of BOE)

		ENERGÉTICOS PRIMARIOS					TOTAL	ENERGÉTICOS SECUNDARIOS							NO	TOTAL	
ACTIVIDAD		CARBÓN	HIDRO	LEÑA	BAGAZO	COMB. VEGETALES	PRIMARIAS	ELECTRICIDAD	GLP	GASOLINAS	KEROSENO	DIESEL OIL	FUEL OIL	COQUE	ENERGÉTICO	SECUNDARIAS	TOTAL
OFERTA	PRODUCCIÓN	0.00	2,090.64	10,984.84	2,927.31	296.44	16,299.23	3,911.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3911.6	16,299.23
	IMPORTACIÓN	321.65		0.00	0.00	0.00	321.65	7.31	1,894.46	3,056.96	635.50	5,017.60	7,723.44	317.77	74.43	18,727.47	19,049.12
	EXPORTACIÓN	0.00		0.00	0.00	0.00	0.00	0.00	1,179.47	0.00	0.00	1.99	128.46	0.00	3.16	1,313.08	1,313.08
	INVENTARIO	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NO APROVECHADO	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	321.65	2,090.64	10,984.84	2,927.31	296.44	16,620.88	3,918.91	714.99	3,056.96	635.50	5,015.61	7,594.98	317.77	71.27	21,325.99	34,035.27
TRANSF.	CENTRALES ELÉCTRICAS		-2,090.64		-1,950.05	0.00	-1,950.05	3,878.14				-177.72	-5,556.80			3878.14	-3806.43
	AUTO PRODUCTORES				-977.26	-53.77	-1,031.03	33.46				0.00				33.46	-997.57
	TOTAL	0.00	-2,090.64	0.00	-2,927.31	-53.77	-5,071.72	0.00	0.00	0.00	0.00	-177.72	-5,556.80	0.00	0.00	-5,734.52	-6,894.64
CONSUMO FINAL	CONS. PROPIO	0.00		0.00	0.00	0.00	0.00	33.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00
	PÉRDIDAS	0.00	0.00	0.00	0.00	0.00	0.00	846.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00
	AJUSTE	0.00	2,090.64	0.01	0.00	0.00	2,090.65	0.00	140.45	-79.94	-116.90	-638.63	216.98	0.00	27.27	429.07	429.07
	TRANSPORTE	0.00		0.00		0.00	0.00	0.00	0.00	2,980.63	44.51	4,521.36	0.00	0.00	0.00	7,546.50	7,546.50
	INDUSTRIA	321.65	0.00	692.05	0.00	242.67	1,256.37	796.43	186.17	119.57	494.92	720.96	1,782.23	317.77	0.00	4,418.05	5,674.42
	RESIDENCIAL	0.00		10,292.78		0.00	10,292.78	1,278.11	172.36	0.00	212.97	0.00	0.00		0.00	1,663.44	11,956.22
	COMERCIAL,SER,PUB						0.00	964.53	216.01	7.59		30.90	38.97			1,258.08	1,258.08
	AGRO,PESCA,MINER.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CONSTRUCCIÓN,OTR.	0.00		0.00		0.00	0.00	0.00	0.00	29.11	0.00	203.22	0.00		0.00	232.33	232.33
	ENERGÉTICO	321.65	0.00	10,984.83	0.00	242.67	11,549.15	3,039.07	574.54	3,136.90	752.40	5,476.52	1,821.20	317.77	0.00	15,118.40	26,667.55
	NO ENERGÉTICO			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.00	44.00	44.00
TOTAL		321.65	0.00	10,984.83	0.00	242.67	11,549.15	3,039.07	574.54	3,136.90	752.40	5,476.52	1,821.20	317.77	44.00	15,162.40	26,711.55

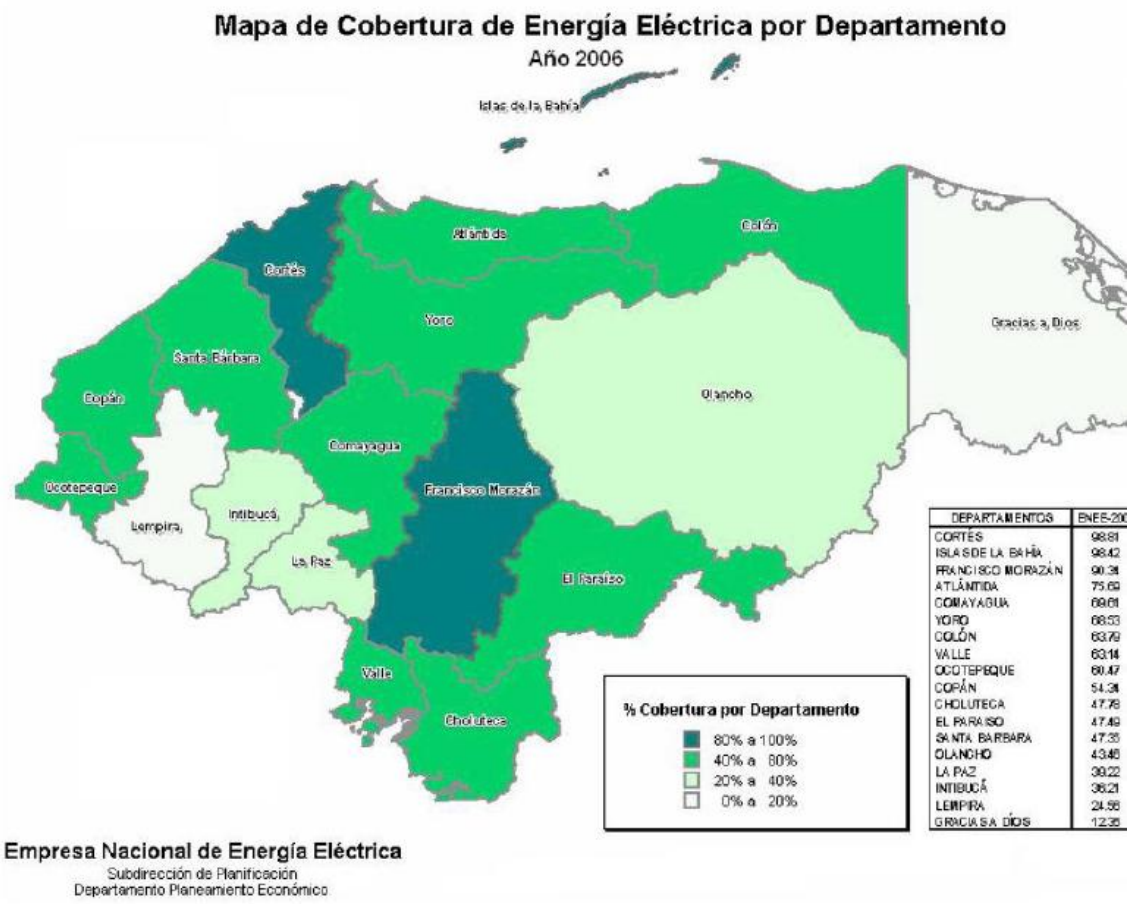
Annex B

Interconnected National System



Annex C

Electrical Energy Coverage by Department
(2006)



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