

HAITI

Outline of Expression of Interest to Participate in SREP

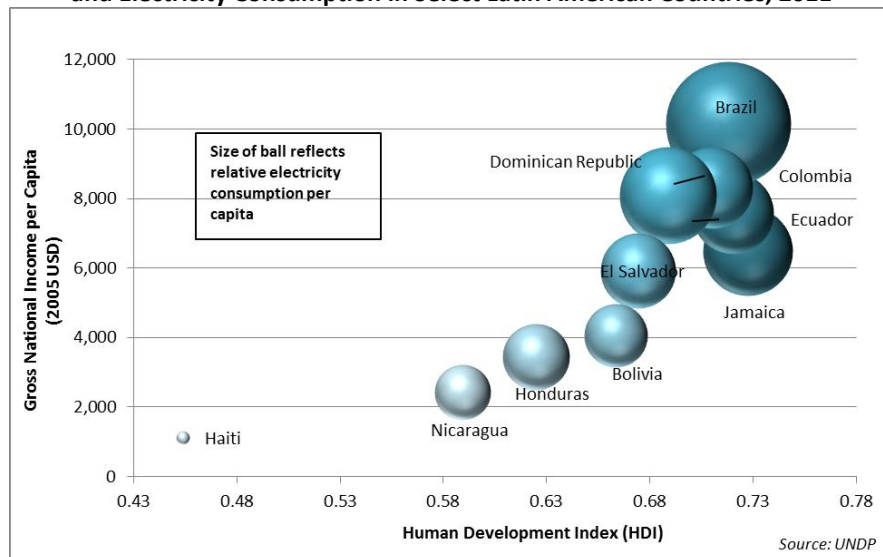
I. COUNTRY AND GOVERNMENT AGENCY SUBMITTING EXPRESSION OF INTEREST

Republic of Haiti
Ministry of Public Works, Transports, Energy and Communications¹

II. DESCRIPTION OF THE COUNTRY AND ENERGY SECTOR CONTEXT

With a nominal GDP per capita of US\$771 in 2012 (source: World Bank, 2013), Haiti is the poorest – and only Fragile² – country in the Americas and in the Western Hemisphere. In addition to causing over 200,000 deaths and a major setback to the economy³, the 2010 earthquake that hit the metropolitan area engendered major demographic movements⁴ and deepened the already existing vulnerabilities. Despite the spectacular rebound of the country's growth rate thanks to the impulsion of its dynamic Administration elected in 2011, Haiti was still ranked far below its regional neighbors (161st globally) on the UN's 2013 Human Development Index⁵.

Figure 1. Human Development, Gross National Income, and Electricity Consumption in Select Latin American Countries, 2011



Haiti has the lowest per capita electricity consumption in the LAC region. At 21kWh per year, per capita consumption is more than 80 times lower than the average for the region, reflective of the very low income levels and access to electricity services.

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² FCS: Fragile and Conflict-Affected Situations, the terminology used by the multilaterals to describe the country's extreme vulnerability.

³ The economy contracted by 5.4 percent in 2010, reversing the modest growth trend of the 5 preceding years. Damages and losses were estimated at US\$7.9 billion (120 percent of GDP) and reconstruction needs at US\$11.3 billion.

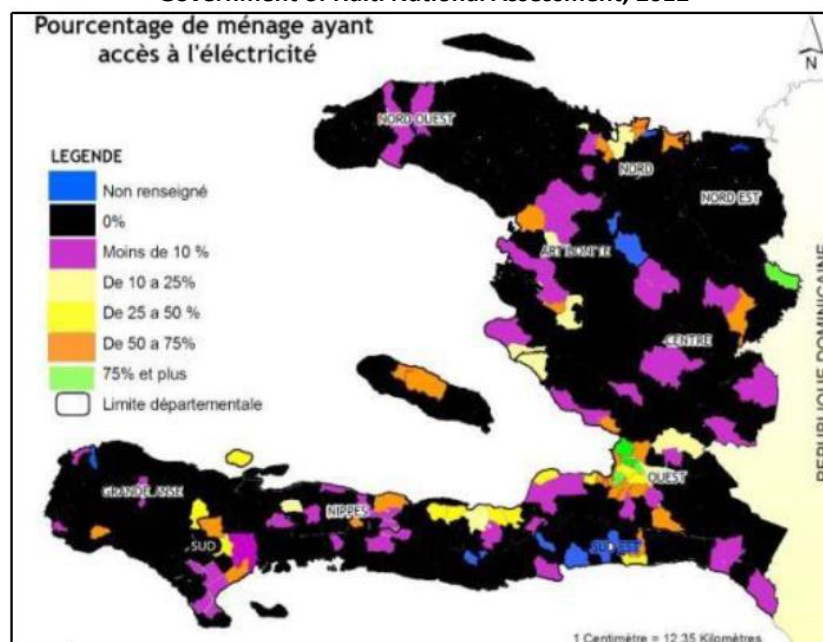
⁴ Since January 2010, about one million Haitians have left the country, and 74% of the 10 million population now lives in rural areas.

⁵ UN Development Program (UNDP), *Human Development Report 2013* (New York: 2013).

Haiti's current electricity infrastructure is aging and has been poorly maintained. The 54 MW Péligre hydropower station, the nation's largest power plant, is operating at only half capacity due to disrepair and sedimentation caused by increasingly severe deforestation. Available generation capacity of approximately 212MW (85% diesel, 15% hydropower) is insufficient to meet an estimated peak demand of more than 250MW in the metropolitan area. The power system's technical and commercial losses – respectively 30% and 35% - largely contribute to this structural deficit, resulting in an average daily service of only 16 hours on the power networks.

Access to electricity is estimated by Government of Haiti's (GOH) internal surveys at 28%⁶ (6% in the rural areas), leaving about 7 million Haitians without basic energy services and with little access to economic development opportunities.

Figure 2. Haiti Households Electricity Access Rate by Municipality, Government of Haiti National Assessment, 2012



Despite a significant proven potential in hydroelectricity, wind and solar energy (see Annex 1), and the high cost of the imported petroleum products⁷, this access rate remained fairly constant over the last thirty years, mainly due to an inadequate enabling framework: only 35 mini-grids are installed and operating, in addition to the 5 isolated grids in the large provinces cities.

The Government of Haiti (GOH) has emphasized the need to use more efficiently conventional fuels in order to reach faster its economic development targets and become an emerging country by 2030. To address the energy demand growth associated with this vision (energy demand to double in the next decade, objective of full access to reliable energy for the expected 15 million people by 2030), GOH is highly committed to promoting the development of indigenous renewable energy sources. Upon his arrival in Office in May 2012, Prime Minister Lamothe

⁶ According to the Sustainable Energy For All Tracking Tools report (2013), the percentage of population having access to electricity was 34% in 2010, of which 12% in rural areas. These numbers still place Haiti far below the other LAC countries.

⁷ Haiti spends around 7% of its GDP on petroleum imports (IMF, 2012).

declared in his General Policy address that the country will reach the target of having “25% of the national electricity mix from renewable energy sources by 2020”. Earlier in 2011, President Michel Martelly has made Energy and the Environment two of his five major national priorities, indicating significant government focus on the intersection of these issues (the national primary energy is composed at 71% by wood fuels, resulting only 3% of the national forest resource).

In the interim version of the National Energy Sector Development Plan (MTPTEC, February 2011), the Haitian government has identified wind power as a national priority, determining that the resource should be developed wherever there is evidence that it may be economically viable. MTPTEC has since allowed private promoters to conduct pre-feasibility studies for wind projects in specific sites.

In January 2012, GOH announced the ambitious goal of electrifying 200,000 rural households over the next three years through the “Banm limyè, Banm lavi” program (“Give me light, give me life”, in French Creole). At an estimated cost of USD 30 million, about two-thirds of which would be awarded by Haitian banks via long-term loans, the program aims to provide much-needed electricity mostly through solar technology. Although the feasibility and status of this initiative remain challenging, it indicates a concrete involvement from the GOH that the future of Haiti’s electricity sector must also be based on renewable energy, not just a greater dependence on imported fossil fuels.

Lately, the MTPTEC translated GOH’s vision on energy into a comprehensive Energy Directions Note, notably providing concrete action items to enhance the use of renewable energy sources in the next two years. The strategy note has been endorsed by the Cabinet on September 15, 2013.

III. RATIONALE FOR SELECTED SECTORS FOR SREP FINANCING

Support for renewable energy has gained momentum since 2010, both from the public and private sectors, creating a market case for some equipment using renewable energy (e.g., solar lanterns). Nevertheless, and despite the numerous project proposals and expressions of interest, there is as of now no existing on-grid wind or solar project in Haiti. The electricity sector’s poor performance, lack of planning and outdated regulatory framework are the main factors impeding the development of renewable energy in Haiti.

The Electricity Sector Organic Law of 1989 is still the law organizing the sector, and has not been reformed or amended since its effectiveness. The absence of feed-in tariffs for the renewable energy sources, the monopoly of the state utility Electricity of Haiti (EDH) on power distribution and sales and the absence of rules for new connections to the grid lead to a legal vacuum in which private promoters and donor countries / multilaterals experienced major difficulties to prepare, advance and implement renewable energy projects.

With 65% of power distribution total losses, the highest power generation cost of the Western hemisphere and inadequate electricity tariff levels, the Haiti power sector is in a situation of structural deficit, requiring about US\$ 200 million of yearly budget transfers to EDH (4% of the national budget). This represents a major hurdle for any renewable energy project promoter

aiming to obtain a power purchase agreement with EDH with the GOH's guarantee (60% of the installed capacity is privately owned).

These barriers are being addressed by the Rebuilding Energy Infrastructure and Access project (PRELEN project, a US\$ 90 million grant from the World Bank to the GOH, effective since February 2013), under the component "Technical Assistance to the MTPTEC". While rehabilitating the distribution grids and assisting EDH in its commercial performance improvement, the project is also currently financing the electricity sector 2015-2030 masterplan and provides assistance to the MTPTEC's newly created Energy Cell to reform the regulatory framework and promote the use of renewable energy.

SREP financing would ideally and timely complement this technical assistance to MTPTEC funded by the World Bank grant, by (i) contributing to the financing of renewable energy pilot / demonstration projects (using partnering with the private sector and regulation by contract, as needed), (ii) catalyzing the implementation of a new and enabling regulatory framework for renewable energy development, and (iii) developing mechanisms to leverage private sector's participation in the subsequent renewable energy projects as well as energy access projects.

The timely implementation of an on-grid wind or solar photovoltaic project supported by SREP with the use of the long term masterplan to develop a national energy strategy on renewable energy development would be invaluable elements to activate a sound and incentivizing regulatory framework on renewable energy in Haiti. For this to happen, a successful pilot initiative is critical to confirm to the promoters GOH's willingness to tap in the important renewable energy potential in a viable and sustainable manner; it would also allow addressing the – wrongly funded - internal resistance on renewable energy in the public administration.

IV. ENABLING POLICY AND REGULATORY ENVIRONMENT

The GOH recognizes the crucial links between sustainable electrification and human development, arguing in its Action Plan for National Recovery and Development that access to basic services, including electricity, should be considered critical investments in human capital and an "engine for the new foundation of Haiti". A reliable and viable power system will be required to overcome many of the country's major long-term challenges, including facilitating economic and social development, stabilizing and restoring Haiti's natural environment, and increasing resilience against natural disasters and economic shocks.

Given EDH's perilous financial situation, the GOH diverts a significant amount from its general budget to cover the utility's expenses and to purchase oil for electricity each year, impeding the necessary public investment in grid rehabilitation and expansion⁹, metering, and other energy infrastructure sub-sectors (including existing renewable energy infrastructure like hydropower). Harnessing domestic renewable energy resources will free up money to be also invested in Haiti's energy access and wood fuels alleviation agendas.

⁸ Government of the Republic of Haiti, *Action Plan for National Recovery and Development of Haiti* (Port-au-Prince: March 2010).

⁹ EDH has been able to extend grid access by only 10% (grid length) over the past several decade.

The current legal framework related with the development of renewable energy is essentially focused on hydropower. It describes the administrative process for a private promoter aiming to use water resource for power generation. In practice, this process is relatively heavy as it involves three Ministries (MTPTEC, Agriculture and Environment), in addition with EDH and the Ministry of Finance if the project is to be connected to the public grid. In 2013, UNDP provided a technical assistance to GOH in order to design a more simple and comprehensive regulatory framework on hydroelectricity; the recommendations of reforms have been transmitted to GOH and should lead to an amendment to the current law. This new framework may also pave the way for a series of reforms regarding the legal framework of all renewable energy resource.

Another necessary reform in the electricity sector is related to electricity cost and tariffs. Haiti's first power purchase agreements (PPAs) have been agreed and signed in the 2000s, in a non-transparent manner, impacting the market economy for the sector¹⁰. The GOH decided to address the issue in 2013 by creating a commission in charge of the renegotiation and harmonization of all the PPAs; positive outcomes of this process may be beneficial to the business environment in the power sector, and in Haiti's economy in general. However, the offtake risk on PPAs will remain substantial until the electricity sector performance improves and the state utility able to handle its power purchases obligations without public budget transfers.

On the demand side, if the residential tariffs are below the average of the Caribbean region, the tariffs for the industrial and commercial customers have been on the higher end of the regional range.

Table 1. Electricity Prices in Haiti, 2012

cUS\$ per kWh	Average Residential	Residential (<200 kWh/month)	Average Commercial	Average Industrial
2012	16	12	35	36

Source: EDH, 2013

Subsequently to the ongoing electricity masterplan study, EDH will conduct an investment plan and tariff reform analysis (expected in end 2014). The recommendations from these studies will serve as decision tools for the GOH to implement a sound energy strategy and reform the legal framework accordingly.

In order to incentivize private investment in Haiti, and in renewable energy in particular, the GOH has put in place new entities in charge of the dialogue with the local and foreign investors. The Center for Facilitation of Investments (CFI) is providing since 2012 a series of tools and assistance to help understanding the legal framework and inform about the opportunities (tenders, requests for proposals, partnership proposals). The Central Unit for the management of Public Private Partnerships (PPP) located in the Ministry of Finance has become in March 2014 a Direction of PPP Management, reflecting the high interest of the GOH in involving the private sector in its economic development, in a collaborative and transparent manner. The Procurement

¹⁰ Due to high contractual capacity take-or-pay clauses, the power system is not functioning on a 'merit order' basis. The fact that all available generation is utilized has mitigated the impact of this sub-optimal operation of the system.

authority – the National Commission of Public Procurement and the Treasury Commission on Procurement – ensure the respect of Haiti’s competitive procurement rules.

On the private sector side, the market for renewable energy goods and services has expanded considerably since 2010. About 8 firms of a significant size (20 employees and over) are now proposing solar powered equipment, for individual uses as industrial level installations. Some of these equipment – hurricane proof solar street lights - are labeled ‘made in Haiti’ (50% or plus of their value is local) and benefit from special tax exemption, allowing them to be competitive on international markets and export (Morocco, Senegal). On wind energy, several promoters and investors have initiated feasibility studies for projects of significant sizes (10 MW and above): results of these studies will be known in 2015, but the involvement of local and international investors in specific wind projects give a valid indication of the market readiness on the supply side.

V. INSTITUTIONAL AND TECHNICAL CAPACITY

The MTPTEC is the GOH entity in charge of the energy sector regulation and management. It has currently 3 entities under its responsibility to do so: (i) the state power utility EDH, (ii) the Bureau of Mines and Energy (BME) and (iii) the Energy Cell. In terms of technical capacity, EDH and the BME currently have about a dozen of civil servants (engineers, economists, technical experts) knowledgeable in renewable energy technology development, deployment, operation and maintenance. The PRELEN project (IDA grant) is starting an empirical study with EDH engineers on the potential impact of variable renewable energy on Haiti’s grid and EDH’s level of service; this study is intended to feed the renewable energy scenarios in the masterplan under preparation.

The IDA grant is also providing a substantial assistance to the MTPTEC in order to staff adequately its Energy Cell with local and international experts having legal, planning and technical skills on renewable energy. In the medium term, the Cell is intended to evolve into a Direction of Energy in MTPTEC; the creation of a Rural Energy Agency is also envisioned, to foster and coordinate the development of energy access.

With these institutions that are being put in place or already functioning, it is expected to have the sufficient capacity to implement demonstration projects while accelerating the reform of the regulatory framework. Despite the positive signs and initiatives for the development of renewable energy in Haiti, the implementation risk remains substantial as this new energy sub-sector may face various difficulties and delays in a fragile environment. The potential transformational impact in terms of inclusive growth, green jobs and climate change definitely lowers the risks / rewards ratio.

VI. PROGRAMS OF MDBS AND DEVELOPMENT PARTNERS

Several development partners are contributing to the development of renewable energy and energy access in Haiti, usually in the form of grants or technical assistance to the Government (see table below).

IDB¹¹ is considering providing a substantial support to energy access in Haiti in the near future. IFC is looking at opportunities for investments in hybrid systems (diesel generators coupled with wind turbines or solar PV) for both commercial and industrial applications as well as rural mini-grids with “anchor tenant” off-takers. IFC is also examining the potential for financial structures to support solar PV installers for large-scale commercial applications as well as devices (e.g. PV lanterns) for residential applications.

Table 2. MDBs’ active projects and programs on renewable energy and energy access in Haiti, 2013

MDB	Project	Energy Source	Budget (mUS\$)
IDB, KfW, and OPEC	Peligre dam (2012-2013)	Hydro (rehabilitation and upscale from 36MW to 54MW)	60
USAID	North industrial zone (2012)	PV and Wind (on-grid)	25
USAID	Wood Fuels Alleviation Program	Promotion of efficient stoves, energy efficiency and fuel substitution (to LPG) in urban commercial activities	8
UNEP	Haiti Regeneration project, in South region (2012-2015)	Small hydro rehabilitation, rural PV for productive activities	9.7
UNDP (Norway grant)	Haiti Regulatory Framework on Small Hydropower	Create enabling environment for the development of the 104 potential Small hydro sites	1.3
World Bank (IDA)	Emergency Solar Lanterns project (2010-2011)	55,000 lanterns distributed to 450,000 camp beneficiaries.	1.5
	Rebuilding Energy Infrastructure and Access Project (2013-2017)	PV, solar street lights, technical assistance, rural electrification using viable renewable energy.	8

The SREP program in Haiti would benefit from most of these initiatives, as they contribute to (i) create a critical mass of firms and small entrepreneurs to maintain the renewable energy infrastructure, (ii) provide an enabling environment on the market and regulatory sides and (iii) strengthen the improved performance of the power system (Peligre rehabilitation). Most importantly is the subsequent leverage effect that the SREP program may have within the MDBs and the private sector.

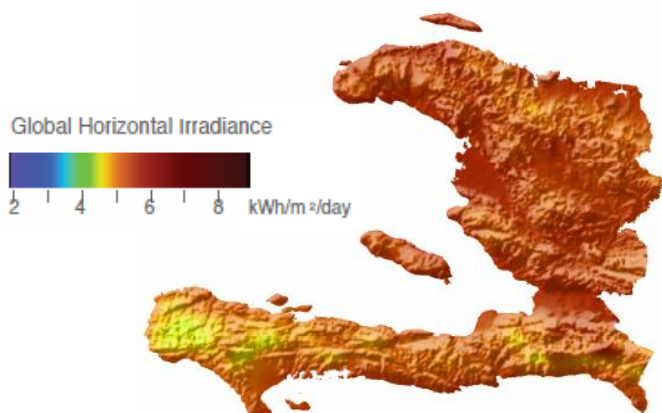
¹¹ IDB has confirmed on April 01, 2014 the renewal of its US\$ 200m yearly grant allocation to support the GOH

Annex 1 – Haiti Renewable Energy Resource Potential

Haiti has very strong renewable energy potential spread across the country and can meet almost all of its power demand with the resources already assessed. Wind farms and distributed solar photovoltaic (PV) generation are especially viable and could be central in the country’s future energy mix. In addition, small hydropower, biomass, and waste-to-energy can each play a limited but important role in powering the country. Small hydro capacity additions can be especially useful for expanding energy access to remote and underserved locations. Finally, Haiti needs to develop a long-term waste management strategy to efficiently harness its waste-to-energy potential. Renewable energy resource is fairly equally spread on the national territory. The Port-au-Prince metropolitan area, home to a quarter of the country’s population, has some of the greatest solar and wind resources.

Energy Source	Resource Assessment	Installed / Potential	Comments
Large Hydro	GOH (2010)	30 / 150 MW	IDB is rehabilitating Peligre hydro plant (30 to 54MW) and re-estimating ‘Artibonite 4C’ hydro project (32MW).
Mini Hydro	GOH (2010)	6.8 / 100 MW	An important potential for rehabilitation of small hydro (run of river).
Wind	EU-3E (2006)	0 / 70-80 MW	Pilot of 100kW ran in 1986-88 (KfW funding), MTPTEC aggregating wind measurement since 1991; 2 pre-feasibility studies currently conducted..
Photovoltaic	3Tier (2011)	1 / 200 MW	About 4,000 solar street lights and 1 MW cumulated PV panels installed.
Biomass	No Assessment	No estimate	Potential in sugar cane and wood factories; some experiments using jatropha for biofuel production.
Waste	NREL (2011)	0 / 25-30 MW	NREL recommends small biogas to energy plants (5MW) in each city.

A- Solar Energy



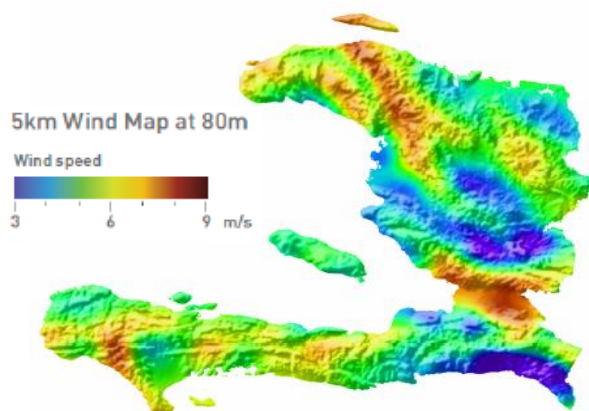
Haiti Solar Resource Map (source: 3Tier, 2011)

Haiti’s solar energy potential is extremely strong across the entire country and consistently strong throughout the year, even in winter months. The global horizontal irradiance, or GHI, ranges from 5 to 7 kilowatt-hours per square meter per day ($\text{kWh/m}^2/\text{day}$) throughout most of the country and nears $8 \text{ kWh/m}^2/\text{day}$ in some regions.

Although all of Haiti has a relatively uniform and strong solar resource, the greater Port-au-Prince area and the coastal region between Gonaïves and Saint-Marc show particular potential, which is especially important given that these areas are dense population centers.

Distributed solar PV generation at the household and commercial levels can play an important role in Haiti's energy mix. Solar PV has demonstrated that it is capable of powering major energy consumers, such as the Mirebalais Hospital (largest installed PV capacity with 400 kW). As of now, no PV generation is connected to the power grid.

B- Wind Energy



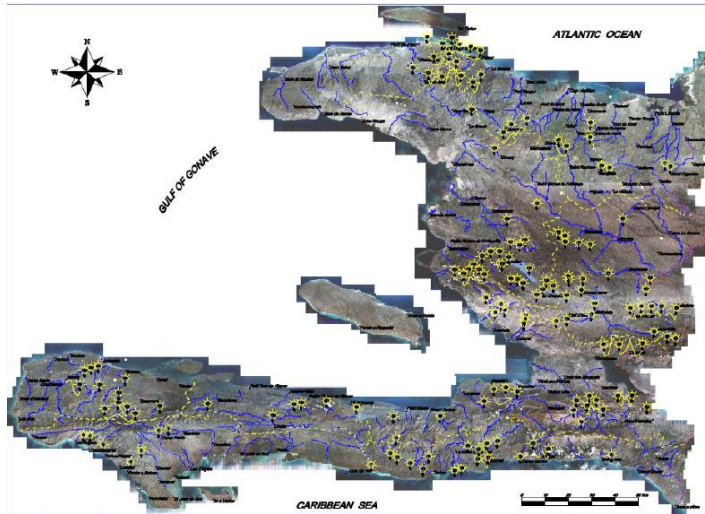
Haiti Wind Resource Map (source : 3Tier, 2011)

Several locations in Haiti have extremely strong wind energy potential. Just a few medium-sized wind farms throughout the country could provide a majority of Haiti's current power demand. Wind energy potential varies throughout the day and year, meaning that installation sites need to be chosen carefully and in accordance with other production areas, sources, and load centers. Lac Azeui (East of the metropolitan area) stands out as having very strong and consistent wind resources throughout the day and year.

There is currently no wind turbine operating in Haiti. In 2006, the Belgian company 3E performed wind potential assessments for five regions of the country at a 50-meter hub height, and in 2010 the U.S.-based NREL performed a national assessment at an 80-meter hub height. Like much of the Caribbean, Haiti benefits from trade winds, the year-round steady winds that enter the region from the northeast and strengthen in the winter. Most of the country has sites where the average annual wind speed is at least 6 m/s at a hub height of 80 meters.

Haiti has strong wind energy potential overall, estimated at 70 to 80 MW with the current technologies, and several regions demonstrate resource capacities that are suitable for wind power development. Although most regions of the country are located near sites with average annual wind speeds of at least 6 m/s, the greater Port-au-Prince area and the southwestern and northern regions show the most potential. Despite variability across the country, most study sites demonstrate a peaking resource in the late night and early morning, as well as seasonal peaks during the summer months, which could help to meet cooling needs during the slightly warmer season.

C- Hydropower



Haiti currently has 62 MW of installed hydropower capacity, making hydro the second largest source of electricity in the country. The country's *operating* installed capacity, however, is only 40 MW, due to sediment build-up in reservoirs and the decreasing efficiency of turbines.

Many of Haiti's hydro plants do not generate near their full capacity: for example, although the Péligre dam capacity is 54 MW, it is estimated to operate nearer to 36 MW because of sediment build-up and the fact that one of its turbines is not operational.

Haiti Hydropower Resource Sites Map (source : Soleo, 2012)

Four large hydropower (>10MW) sites have been identified, the 32MW Artibonite-4C site being the most advanced project¹².

Table 3. Summary of Hydropower Potential in Haiti

	# Sites Evaluated	Small Hydro Sites (>1 MW)	Micro Hydro Sites (0.1 MW–1 MW)	Pico Hydro Sites (<0.1 MW)	Capacity (MW)	Energy Output (GWh/y)
Total	140	27	72	41	102.3	896.5

Source: Soleo, 2012.

D- Biomass Energy

Currently, an estimated 95% of Haiti's 10 million people use charcoal and wood fuels for their daily cooking needs; together, these fuels account for 71% of the country's total energy consumption (charcoal at 39% and wood fuels at 32%¹³). As a result, Haiti is one of the world's most deforested nations: only 3%¹⁴ of the country's original forest cover is remaining. Although many alternatives exist, a robust analysis of the economic, environmental, and social consequences of each is necessary for making informed decisions about future energy development.

Biomass potential remains significant in Haiti. In particular, by utilizing the unused waste from sugarcane production, Haiti could supply up to 9.5% of its current electricity production using biomass energy and bio-ethanol produced. This approach may reduce many of the environmental and food-price impacts typically associated with biomass generation by avoiding the need to grow crops dedicated specifically to power production.

¹² Feasibility study conducted by the Government of Brasil in 2011, discussions with private firms, Governments and multilaterals to co-invest.

¹³ IEA Energy Statistics, "Share of total primary energy supply in 2009: Haiti".

¹⁴ Mongabay, "Haiti Forest Information and Data," 2011