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Renewable Energy in Cuba

Background

In 1993, a National Energy Sources Development Programme (Programa de Desarrollo de las Fuentes Nacionales de Energia) was implemented to reduce Cuba's energy imports and obtain maximum benefits from domestic energy sources. The main objective of the programme was to save energy and use more renewable sources of energy.

With the introduction of the Energy Revolution massive progress on energy efficiency and renewable generation has been achieved. It concentrates in five main points: energy efficiency and conservation; increasing the availability and reliability of the national electric grid; incorporating more renewable energy technologies into their energy portfolio; increasing the exploration and production of local oil and gas; and international co-operation.

Current Situation

In December 2012, the Cuban government passed a decree law establishing a commission in charge of drawing up a renewable energy promotion policy. The setting up of wind farms, solar energy facilities, biomass and biogas plants as well as a large number of windmills are part of the Cuban renewable energy strategy.

Fuel consumption in Cuba exceeds 8 million tons per year. Over 5 million tons are imported at a cost of around USD$4,000 million. Cuba is therefore encouraging an increase in the use of Renewable Energy Sources in all economic sectors to foment a change in the energy matrix allowing to reduce dependency from fossil fuels, energy costs, and environmental impact.

Power generation by co-generation could provide a boost to a declining industry, generate profits through the sale of electricity, lead to growth in other industries, reduce the costs of power production, guarantee a greater amount of energy for the industry and the country, increase the installed capacity, reduce the dependence on imported oil, and have a positive impact on the trade balance.

Only 3,9% of the energy currently generated in Cuba is from renewable energy sources (RES); 2,9% from sugar biomass, 0,6% from hydroenergy, and 0,2% from wind energy. 92% of existing facilities are offering services, while the remaining 8% is affected by deficient maintenance and exploitation.

One of the key problems for the development and growth of RES in Cuba is the low availability of financial resources; limited possibilities to guarantee necessary equipment, components and spare parts; and the lack of qualified personnel to design, execute, operate and maintain projects.

Cuba's Renewable Energy Potential (as per the Ministry of Energy- 2013):

- 1100 MW - Wind energy
- 135 MW - Hydroenergy
- 5 kWh/m^2 – Photovoltaic day-average Energy
- 4 300 kcal/m^2 - Solar thermal energy
- 764 MW - Sugar biomass
- 4 TOE per wind mill per year
- 491 million m^3 (221k TOE) Biogas
- 1.7 million TOE non-sugar Biomass

Solar Energy

Every square meter of the country receives an average amount of solar energy equivalent to 0.5 kilograms of oil or 5 kilowatt-hours, throughout the year and almost without fluctuation.

In Cuba, this technology has been mostly applied in remote and mountainous areas to power audiovisual and other equipment. Solar heaters made in China are sold in Cuban stores and widely used in public facilities.

The solar panels used in the country are partly produced by the Cuban Electronic Industry -70 percent of all the solar panels were assembled in Pinar del Río, and 100 percent were installed by the Copextel company ran by the Ministry of Computer Science and Communications (MIC).

The Cuban government also exports solar panels assembled in Cuba to other Latin American countries and, many hotels are increasing the use of solar panels to comply with ecological standards.

Current plans include the development of Solar Parks with a generation capacity between 1 and 10 MW.

Wind Power

In Cuba, wind energy use is relatively new, beginning with small generators used to extract water from the wells for cattle ranches. Currently, there are four wind farms set up in Ciego de Ávila, Holguín, and the Isla de la Juventud with a total capacity of 7.2 MW.

Cuban experts have created a wind map of the entire country with 32 areas identified with good potential. There are currently 55 stations installed to measure wind and over 8000 wind towers.

Studies show a generation potential ranging between 5 and 14 GW of energy with a cost of two cents per kilowatt. Once the initial investment is recovered this is one of the cheapest sources of energy sources in the country.

Another area of research is currently the effect of natural disasters, especially hurricanes. In the experimental wind farm on the Isla de la Juventud, the windmills used that can be fully taken apart in 45 minutes if required.

New projects include the creation of the 51 MW windpark in Las Tunas province. This park will contain 34 wind turbines with a 1.5 MW capacity per unit. Estimates suggest that the investment will be recovered in a period of six years and the cost of megawatt generated by hour will be of USD$ 80 per every megawatt-hour.

Biomass and Electricity from the Sugar Industry

The Cuban sugar industry shows the greatest possibilities in using biomass from sugarcane waste by taking advantage, amongst other things, of the vast experience of farmers.

The production of sugarcane biomass has been gradually decreasing from 2002 when a restructuring of the sugar industry led to the closure of dozens of mills. In 2008, the production of biomass in the industry increased 13 percent in relation to 2007, while power generation from this source increased 28 percent, showing an increase in efficiency when using this raw material.

The sugar industry also provides the infrastructure for the treatment of waste materials, turning them into useful by-products. Currently, biogas, electricity, and fertilisers are obtained from sugarcane waste materials.

Cuba has made significant advances in the development of a variety of sugarcane with high fibre content and thus a superior energy producer. Crop performances under ideal conditions can surpass 100 tons per hectare, and harvest waste produces up to 20 percent more combustible material.

However, sugarcane is not the only source of biomass. There are other sources of organic material in Cuba, such as firewood, solid organic material, rice and coconut husk, forest debris and coffee waste, which are not currently being used to their full potential. Besides, plans are underway for the use of about 1,000 organic-waste processing plants for the production of electricity.

The first Joint Venture in the sector was recently signed with Havana Energy (a British company) for the construction of a 60MW biomass power generation plant at Ciro Redondo in Ciego de Avila. The plant will use bagasse from the sugar harvest and marabou, a locally-available invasive woody weed.

Hydropower

The Cuban Institute of Hydro-Resources has worked for years on the identification of hydropower potential throughout the country.

Today, there are over 176 hydroelectric plants in Cuba, located in dams, mini-dams, rivers and canals; 28 are linked to the National Power Grid. Total generation reaches over 80 GWh a year, although the plants linked to the National Grid produce 85% of this energy.

Another 12 hydroelectric in collaboration with China are being developed. This project is valued in 16 million dollars and is part of the energy revolution programme and, it is in the hands of Cuban and Chinese specialists. The collaboration program includes the creation in the future of 20 small plants, which will contribute 100 megawatts to the national power grid.

Cuba currently uses a little more than 10 percent of its potential for producing hydroelectricity. In late 2011, the country had 180 hydroelectric plants, most of them small, with an installed capacity of 65 megawatts (MW) and a potential of 600 MW/.

OPPORTUNITIES:

Cuba has expressed particular interest in the following areas: Biomass from sugar cane; Forest biomass; Biogas from organic residues from agriculture and cattle; Thermal; Solar, Wind power, and Hydro energy.

Other interests involve financial solutions for renewable energy projects and in carbon trading and carbon emissions licensing.

The key areas where both suppliers and investors interested in the Cuban market could find opportunities are:

- Biopower
- Solar Parks and manufacturing of solar panels
- Wind Parks and Design of hurricane-resistant wind turbines.
- Hydropower and manufacturing of hydro-power plants
- Waste management
- Sector-related supplies/equipment.