

## Status of the Development of Renewable Energy Projects in the Republic of Panama

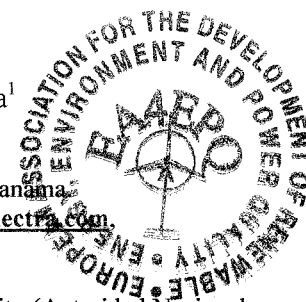
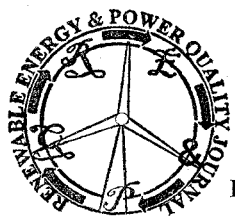
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**Abstract.** The Republic of Panama plans to expand its power generation park by including renewable energy. Currently, more than half of the Panamanian power generation park is comprised of hydroelectric power and the rest is completed by thermoelectric plants, but other energy sources such as wind, solar, geothermal and peat are available. This paper reviews the current status of the Panamanian power generation park, recent renewable energy developments, the legal framework and incentives in place for these projects, and the renewable energy resources available in the country. Finally, some hypothetical renewable energy projects are evaluated, to initially assess their economic feasibility. It can be concluded from this paper that: 1) hydro power is the only renewable currently in the Panamanian power generation park and comprises most of the future projects, 2) wind power is the other renewable with most potential in Panama, with the second-largest number of projects, 3) solar, geothermal and peat resources are available in Panama but there are no current developments to include them as part of large-scale power generation, 4) initial evaluation of two hypothetical hydroelectric and wind projects shows economic feasibility under the given assumptions; however, the project feasibility is dependent on specific site conditions.

### Key words

Panama renewable power generation

### 1. Introduction

The Republic of Panama is located in Central America, with borders to the North with the Caribbean Sea, to the South with the Pacific Ocean, to the East with Colombia and to the West with Costa Rica. It has a population of 3,322,576 inhabitants, according to the 2010 census, over 70% of them living in urban areas.

Panama has, since recent years, been subject to appreciable economic growth fuelled by extensive public investment in large infrastructure projects, such as the construction of new highways, the expansion of Panama City's coastal line or the Panama Canal Expansion megaproject; and large private investment in the areas of real-estate, tourism, banking, among others, and particularly in the energy and power sector.

Panama has been traditionally dependent on hydro and thermal power for the supply of its energy demand, but recent private developments have begun to make use of the country's other natural resources, such as wind, in conjunction with the government's plan to reduce its dependency on imported hydrocarbons, as well as make the current energy grid more efficient. As of 01/05/2010,

the Environment National Authority (Autoridad Nacional del Ambiente, ANAM) had 118 Clean Development Mechanism (CDM) projects within its portfolio, most of which from the private sector.

The purpose of this article is to describe the current status of the power generation park in the Republic of Panama and future expansion plans, as well as describe the current renewable energy developments, legislation and incentives, available resources, and present sample hypothetical case studies for individual renewable power generation projects in the country.

### 2. Electrical Power Generation Park in Panama

#### A. Current Status

By the year of 2008, the installed electrical power capacity of the Panamanian National Interconnected System (Sistema Interconectado Nacional, SIN) was 1,501 MW, whereas the maximum demand (excluding self-generating consumers) was 1,065 MW [1].

The power generation sector in Panama is comprised of several independent producers, with three companies providing approximately 70% of the power generation capacity: AES Panamá (33%); EGE-Fortuna, S.A. (20%) and BLM Corp, S.A. 55% of the Panamanian generation park capacity comes from hydroelectric plants and 45% from thermoelectric plants. The composition of the power generation park is shown on Figure 1.

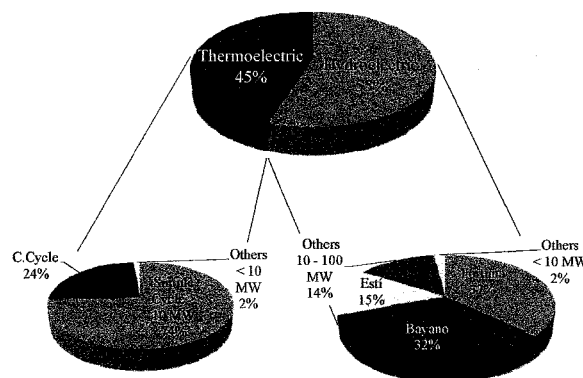


Fig. 1. Panama SIN Power Generation Park Composition (Source data from [1])

The hydroelectric power generation park is comprised of several dams, three of which account for 86% of the total installed hydroelectric capacity: Fortuna (300 MW –