ABSTRACT

The aim of this paper is to present various wind power development scenarios, which could decrease oil consumption in the power generation sector in Jamaica, decrease electricity tariffs to consumers, and decrease overall payments for oil imports in the economy of Jamaica.

Jamaica's energy system is highly dependent on imported fossil fuels, and petroleum imports account for over 90 percent of electricity production. This oil import dependency comes at a high cost, as import costs are high and can be expected to increase further as oil prices rise in the future. Electricity prices for Jamaica's people have increased in recent years. Consequently, according to the Jamaica Ministry of Science and Technology, the country is charting a new path to energy security based on domestic renewable energy sources in order to build an energy system that is socially, economically, and environmentally sustainable.

Prohibitive electricity rates burden businesses and citizens throughout the country, which relies on oil imports to meet 90 percent of its energy needs. This leaves the nation at the mercy of fluctuating oil prices that can make it difficult to budget and plan effectively.

To ease its dependence on imported oil, Jamaica has set itself an ambitious target: generate 30 percent of its energy from local renewable sources, such as hydro, wind and solar power, by 2030.

The shift to sustainable sources of energy comes at an especially urgent time, considering Jamaica's vulnerability to the effects of global warming: rising sea levels, coral bleaching, and changes in the frequency of tropical storms that impact the Caribbean.

The Government's primary objective is to diversify the national energy supply into a mix of energy sources for energy security. The policy of the Government of Jamaica is that there is no restriction on the sources of electricity generation and may include solar photovoltaic, wind, hydro, biofuels/biomass and waste to energy solutions, petroleum coke, coal and natural gas.

The country has two main operational wind farms, Wigton (three phases with a total installed capacity of 62.7 MW) and BMR Potsdam in the Santa Cruz Mountains with 36 MW installed. The performance to date illustrates a capacity factor in the mid 30s and wind measurements in a variety of other regions of the island are equally promising. The studies show that most of the wind energy tends to be produced in the afternoons and evenings, which is when the residential consumption peaks, which is quite promising in terms of balancing the electrical grid. Since most of the existing power generation on the island is oil-based, with engines and turbines that are quite flexible, the future looks good for a significant penetration for fluctuating wind power generation.

We have developed a financial model with associated spreadsheets; these spreadsheets analyze the decrease of oil consumption in the country and avoided associated oil import costs in 50MW stages, starting with 50 MW up to 200 MW. The attached tables illustrate that depending on additional wind power penetration, more than USD 85m p.a. could be avoided in terms of oil payments.

As a concrete example, a **100MW** wind farm will decrease the fuel oil consumption by **82 851 tons**, or **USD 43m** at current prices. Furthermore, the CO2 emissions from electricity generation will decrease by **227 804 tons**.

As next steps in the wind farm development program we propose the development of a bankable feasibility study for the construction and financing of a wind farm in one of the following selected sites: Point Morant, Spur Tree, Rocky Point, Lucea and Robin's Bay.