

Wind Resource Estimation and Economic Analysis for Rakiraki, Fiji

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Abstract : Immense amount of imported fuels are used in Fiji for electricity generation, transportation and for carrying out miscellaneous household work. To alleviate its dependency on fossil fuel, paramount importance has been given to instigate the utilization of renewable energy sources for power generation and to reduce the environmental dilapidation. Amongst the many renewable energy sources, wind has been considered as one of the best identified renewable sources that are comprehensively available in Fiji. In this study the wind resource assessment for three locations in Rakiraki, Fiji has been carried out. The wind resource estimation at Rokavukavu, Navolau and at Tuvavatu has been analyzed. The average wind speed at 55 m above ground level (a.g.l) at Rokavukavu, Navolau, and Tuvavatu sites are 5.91 m/s, 8.94 m/s and 8.13 m/s with the turbulence intensity of 14.9%, 17.1%, and 11.7% respectively. The moment fitting method has been used to estimate the Weibull parameter and the power density at each sites. A high resolution wind resource map for the three locations has been developed by using Wind Atlas Analysis and Application Program (WAsP). The results obtained from WAsP exhibited good wind potential at Navolau and Tuvavatu sites. A wind farm has been proposed at Navolau and Tuvavatu site that comprises six Vergnet 275 kW wind turbines at each site. The annual energy production (AEP) for each wind farm is estimated and an economic analysis is performed. The economic analysis for the proposed wind farms at Navolau and Tuvavatu sites showed a payback period of 5 and 6 years respectively.

Keywords : annual energy production, Rakiraki Fiji, turbulence intensity, Weibull parameter, wind speed, Wind Atlas Analysis and Application Program

Conference Title : ICEERET 2019 : International Conference on Energy Efficiency and Renewable Energy

Conference Location : Singapore, Singapore

Conference Dates : March 28-29, 2019