Potential Analysis of Renewable Energy in Nduga District Papua Mountain Province

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Abstract. The new renewable energy potential in Papua province is 26,529 MW and the installed capacity in 2018 is 20 MW. In 2025 primary energy is targeted to reach 23% to 31%. The river to the airport is 1.5 km from the airport and the Nogoliah river is at an altitude that has enormous potential and is 24 km from the center of Kenyam. With solargis , topographic, measurement methods, and the data 137,450 - 139,500 East Longitude and 4,000 - 4,500 South Latitude produces data for solar Pvout = 1270,7 kWh/Wp = 3,481 kWh/Wp, GHI = 1607,4 kWh/m2, DNI = 890,2 kWh/m2, DIF = 929,9 kWh/m2, GTI = 1594,5 kWh/m2 = 5740,1 MJ/m2. Data Wind 2019 capacity 1kW, Hub.height 80 m, vestas V90 2000 model turbine, highest daily average in October 0.02% and low MCF in December 1% -highest in February 4.50%. From the topographic map data obtained the slope of the Kenyam river level.

Keywords. Nduga District, Potential, Renewable Energy

1 Introduction

Through priority development of national new and renewable energy (EBT) and priority principles of national energy development as well as the general national energy plan (RUEN) and the general national electricity plan (RUKN) [1]-[2]. Solar energy has a huge potential of 200 GW and its utilization is still below 100 MW. Papua Province has 26,529 MW of NRE potential and its installed capacity in 2018 is 20 MW. RUED Papua 2025 Papua has an EBT potential above 20 GW. Geographically, Nduga Regency is located at 137,450 - 139,500 East Longitude and 4,000 - 4,500 South Latitude. Administratively in Nduga consists of 32 districts / sub-districts with a total of 248 villages [3]-[4]. Nduga Regency is led by the Regent, Bpk. Yairus Gwijangge (deceased) and was replaced by Mr. Namia Gwijangge, S.Pd., M.Si on 27 May 2022 in Jakarta and inaugurated by the Minister of Home Affairs of the Republic of Indonesia.

The potential for renewable energy in the regions needs to be improved and studied more deeply as input to local and central governments [5]-[6]. In 2025 it is targeted to reach 23% to 31% in 2050 because Indonesia has the potential to achieve primary energy [7]-[8]. The primary energy mix for special NRE power plants has increased from the 2021 target of 12.9% to 13.5%, while the 2022 plan is 12.8% [9]. Wind energy, Wind rotates wind turbines, creating mechanical energy that is converted to electrical energy. Wind turbines that convert mechanical energy into electricity come in vertical axis arrangements and multiple axis horizontal arrangements. Turbines generating low power (10–100 kW), medium power (100 kW–0.5 MW), and high power (>0.5 MW) are mature technologies. The solargis application model makes it easier to collect data and find out the energy contained in the research target area [10]-[11]. Rivers produce water as renewable energy [12], the potential of forests that are still maintained can overcome free carbon in nature and also affect renewable energy as free energy in the air [13]. Improvement and concern for local energy needs to be a material for sustainable studies [12].

2 Research Method

In this study, the method used is a direct observation regarding the potential for renewable energy in the Nduga District area of Papua Mountain. The data was taken using GPS and Google Earth in an environmentally friendly area, namely Kenyam city. The data collected will be collected using the Solargis Map method to map the spectrum color of the area as well as the Renewables Ninja method to obtain wind energy data and the type of turbine suitable for driving the wind turbines to be built.

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3 Results and Discussion

3.1 Geographical and Topographical Analysis

Update of new renewable energy map by P3TEKEBTKE on ESDM one map and potential energy like PLTS, waste energy, and wind energy [2].

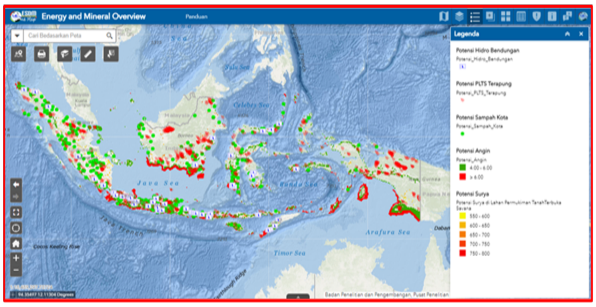

Fig. 1. Energy and Mineral Overview
Discription :
Hydro Dam potential, * PV Floating Potential, * Potential Scum of the City, Wind Potential

Wind potential in Indonesia can be seen from the green and red colors where the Provinces Papua Tengah, Papua Mountains, and Papua Selatan have great potential. Nduga Regency also appears to have potential.

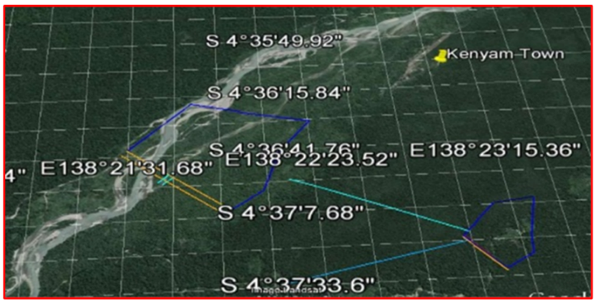

Fig. 2. Geography of Kenyam city with Meansuremant

The initial site visit plus table study using Google earth GPS satellite shows 2 ideal locations to consider for the green power plant using natural and renewable water resources.

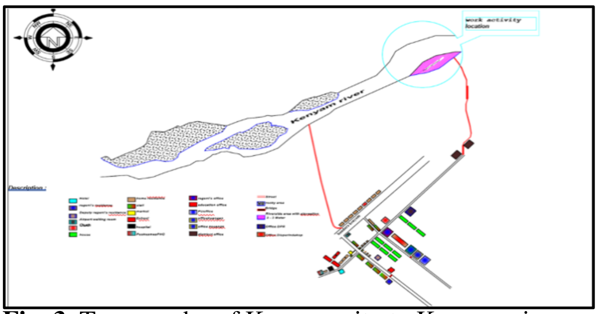

Fig. 3. Topography of Kenyam city to Kenyam river

The pink area is the riverside area with a height of 2-3 meters. Rocky area or coral / gravel with black spots in the Kenyam river. The location of the activity in question is the area that will later become the highest point or the starting point of measurement to get the slope of the Kenyam river.

Fig. 4. Topographical Analysis of the Kenyam river

There is a very good water source located in the hilly area which is located about 24 km from the center of Kenyam city. The terrain to get to the location is very difficult and full of challenges, but it can still be overcome if there are sufficient funds to be able to build a PLTMH in that location. From the survey results and initial observations from the airport runway, the Kenyam River is located about 40-50 meters above the river valley. There is also quite a lot of water flow coming from various sources around the hills. Kali Nogoliat can be a reliable source to consider.

3.2 Solargic Simulation

PVOUT conditions can be seen through the color spectrum table such as Fig. 5., the yellow color in the image is adjusted to the color spectrum in the PVOUT table. Drawn refers to the PVOUT value of Nduga Regency, which is 1270,7 kWh/kWp.

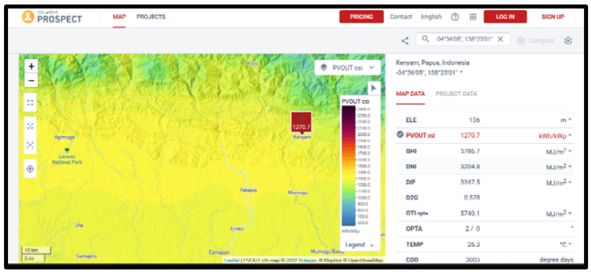

Fig. 5. Potential Energy in Nduga

In Global Horizontal Irradiance (GHI) conditions, the dominant color is dark yellow if it is adjusted to the color spectrum below the GHI value = 1607.4 kWh/m2 in Nduga district.

Fig. 6. District Weather Conditions. Nduga/Kenyam

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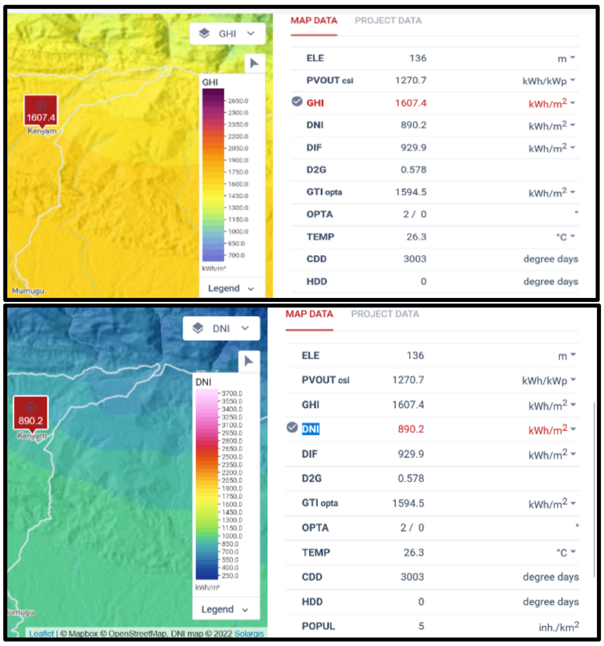

Fig. 7. Model for determining the solar value spectrum

At a temperature of 26.3o and at the resulting PVout conditions1270,7 kWh/Wp = 3,481 kWh/Wp per day, global horizontal irradiance (GHI) 1607,4 kWh/m2, direct normal irradiation (DNI) 890,2 kWh/m2, difuse (DIF) 929,9 kWh/m2. Global tilted irradiance/irradiation (GTI) 1594,5 kWh/m2 = 5740,1 MJ/m2.

3.3 Wind Turbine Simulation

The initial ESDM data from wind potential in Nduga district, it can be obtained from the average speed data which is converted into a power density map and energy map to determine the location and selection of turbines [2]. wind potential in 2019 the capacity reaches 1 kW at a height of 80 meters, the turbine model that will be used according to the data is Vestas V90 2000. Mean Capacity Factor (MCF) is 2.63% and the highest is in March 4.02%.

4 Conclusion

The prospect of EBT in Nduga Regency from direct measurements in the field and observations through solargis has a high prospect, this can be seen from the photographic data by obtaining data on the Kenyam river with a slope, also the PVout value of 1270.7 kWh/Wp, GTI 1594.5 kWh/m2 and GHI 1607 ,4 kWh/m2. A high DIF/GHI ratio can reduce low electrical energy production. For the potential wind in 2019 with a capacity of 1kW, hub. height 80 m, the recommended turbine model is the Vestas V90 2000 type.

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