Potential Analysis of Sea Wind Energy To Electricity at Ancol Beach Jakarta

Kunto Wibowo

Department of Electrical Engineering, Universitas Gunadarma, Depok, West of Java, Indonesia

Email: mazkunto@staff.gunadarma.ac.id

Abstract

The background of this research is how to find out the energy level on the Jakarta coast that utilizes sea wind energy into electrical energy with the presence of wind energy as a source of electrical energy in the future at Ancol Beach will be able to help the surrounding community and especially Ancol Beach in developing new and environmentally friendly energy sources. so that it can be developed into energy that can illuminate or help Ancol Beach in creating energy that can always exist. The method used in this research is to use literature reviews and conduct tests on Ancol Beach so that Ancol Beach can know the level of sea wind energy that can be converted into electrical energy. The problem raised in this study is how to change wind energy on a beach so that it can be utilized into good and environmentally friendly electrical energy. The purpose of this study is how to find out the results of the wind power of Ancol Beach Jakarta which will be converted into electrical energy because by knowing how strong the wind strength of Ancol Beach Jakarta will be, you will be able to find out how much power that will be generated can be converted into electrical energy.

Keyword: Sea Wind Energy, Electricity Energy, Ancol Beach, Jakarta.

1. Introduction

Energy is one part of nature that cannot be separated by humans and other creatures, therefore the use of energy will be maximal in helping humans in daily life, energy utilization can also be done from several elements such as water, fire, wind elements. The use of wind energy is one part of this research, therefore is it certain that this energy can help people in their daily lives and somewhere can be a place that can be used as a wind power plant that will be tested in this research [1]. The use of energy that is now widely used is the use of solar energy and wind energy because a lot of that energy has not been maximized in energy utilization. Broadly and can be sustainable with wind technology, it will be able to provide electrical resources that will greatly help the community in the future [2]. The method used in this research is to use the literature review method by using a lot of reading books so that they can find research problems. and continuously so that it gets the answer you are looking for, therefore the test is carried out on the Ancol beach so that it gets the answer Is it possible to generate electricity on the beach if you use wind power [3].

The problem in this research is how to increase the energy potential, especially in the sea wind that can be used as electrical energy on a beach, namely Ancol Beach, Jakarta, with trials on the beach it will be known whether the chain is feasible or not to be used as a wind power plant. Which can be used as a new source of energy for the surrounding community or the wider community [4]. The purpose of this research is how the story helps the community in finding new energy sources that can be environmentally friendly and do not interfere with the
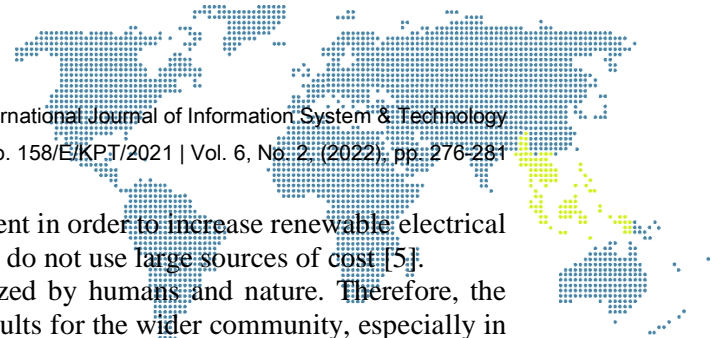
existing environmental ecosystem. Future development in order to increase renewable electrical energy sources that are environmentally friendly and do not use large sources of cost [5].

Energy is one of the resources that can be utilized by humans and nature. Therefore, the maximum utilization of energy can provide good results for the wider community, especially in the field of electricity. can be a stepping stone in the future in providing hydropower so that it can help distribution of electricity in remote areas that lack electricity supply from the center, the utilization of sea wind energy is maximized if given tools that support and can help the community in getting cheap energy and friendly energy [6]. Therefore, the use of coastal wind energy is time to continue to be developed which continues to build its infrastructure and can continue to help the community in developing environmentally friendly electricity [7].

Dependence on electrical energy has become a part of human life. Therefore, new energy continues to be developed that will be able to help dependence on electricity. The source of electrical energy is still based on coal and fossil energy, therefore the existence of new energy sources that can produce electricity will be of great help to the community. in getting electricity even though it is in a place far from natural resources that must be applied to the area is also a very basic human need [8]. Therefore, electricity developed based on new energy such as wind, water and air will continue to be developed in the future to help the community in obtaining electricity cheap and environmentally friendly electricity, the need for electricity increases every year, therefore Indonesia should not have an energy crisis because of the shortage of energy troops, one of which is wind energy [9].

Jakarta is the capital city of Indonesia with many tourist destinations in other big cities. Therefore, one of the places that is very concerned is the Jakarta beach, therefore Ancol Beach Jakarta is one of the icons of the city of Jakarta which continues to be maintained and developed using energy as well has started to be carried out on Ancol Beach, Jakarta so that renewable energy energy can be used to develop electricity in the future to assist in the manufacture of cheap and environmentally friendly energy. on the beach it has helped quite a lot and can be used as renewable energy as electrical energy. With the use of wind energy, the Jakarta beach will be able to make a good contribution to the community, especially in terms of energy [10].

2. Research Methodology

This section will discuss how this research method takes place and how these stages are carried out in order to produce research answers that will be able to answer the research problem according to the first part therefore the stages carried out in this research the first is the literature review stage [11]. which uses the basis of previous research journals that discuss the same research in order to be able to find new research problems after that the second stage is how to conduct trials at a predetermined place so that it can be seen that the wind power that will be generated in that place can be used as electricity in order to help the public at large in finding new energy sources, the final stage is how to conclude whether the results of the trial can be used as a source of electrical energy and can be ascertained to be a renewable and environmentally friendly energy source [12].
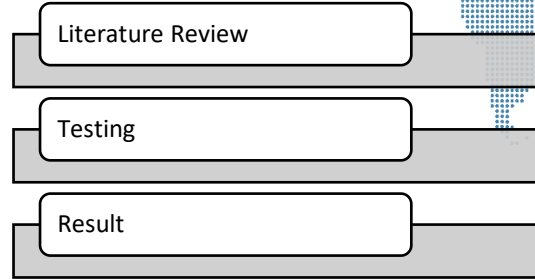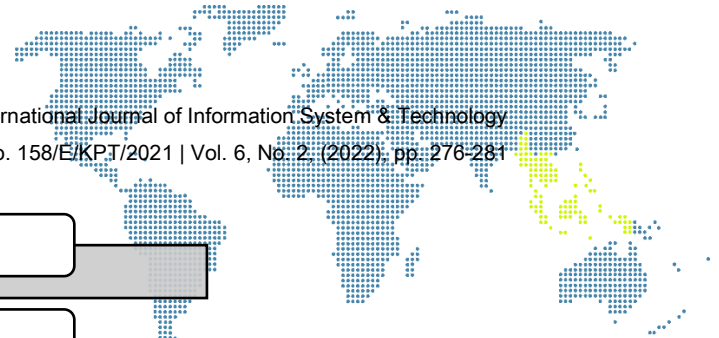
Figure 1. Research Method

This research takes 5 days from July 1, 2022 to July 5, 2022 this research takes place on the Ancol beach by utilizing the existing wind power on the beach so that it can be seen that existing wind energy exists so that it can be ascertained that it can be used as a source of electrical energy. The tool used is an android phone that contains the Zephyrus Wind Meter application to measure wind speed using sensors.

3. Result and Disscusion

In this section, we will discuss how the data is taken and how the data is processed. Therefore, with primary and secondary data, it will be able to produce data that can be processed so that it can be ascertained that the change between wind energy to electrical energy, with this, can help development and Saving energy that is environmentally friendly to the surrounding community so that it can reduce the burden of costs that must be reduced to pay for electricity in the local area, especially the Ancol beach area Jakarta.

Table 1. Data From Location Test in Ancol Beach Jakarta

No	Date	Temperature	Level	Location					
				Point 1		Point 2		Point 3	
				Time	m/s	Time	m/s	Time	m/s
				Day 1					
1	1-7-2022	31-34	Average	07:00 – 07:30	1,3	07:31 – 08:00	2,3	08:01 – 08:59	3,6
2			Minimal		2,4		4,5		4,7
3			Maksimal		4,5		6,7		5,6
				Day 2					
1	2-7-2022	32-34	Average	07:00 – 07:30	4,3	07:31 – 08:00	3,5	08:01 – 08:59	4,2
2			Minimal		3,7		6,7		6,3
3			Maksimal		6,5		5,4		7,2
				Day 3					
1	3-7-2022	31-34	Average	07:00 – 07:30	5,4	07:31 – 08:00	2,3	08:01 – 08:59	2,2
2			Minimal		3,2		5,1		3,5
3			Maksimal		7,3		6,2		6,1
				Day 4					
1	4-7-2022	33-34	Average	07:00 – 07:30	1,4	07:31 – 08:00	2,2	08:01 – 08:59	3,6
2			Minimal		4,5		2,6		4,6
3			Maksimal		6,7		3,5		6,7
				Day 5					
1	5-7-2022	33-34	Average	07:00 – 07:30	3,5	07:31 – 08:00	2,1	08:01 – 08:59	2,9
2			Minimal		6,4		4,2		4,2
3			Maksimal		8,3		6,3		6,6

Based on table 1, it can be explained that there are three places that will be used as locations for data collection at certain hours, the first is 7 to 7.30 hours, the second is 7.31 to 8 hours, the third is 80:01 to 9 hours with using low level average and maximum. Based on data collection on the first day, the lowest wind data is 1.3 m/s and the highest is 6.7 m/s. Based on data collection on the second day, the lowest wind data is 3.5 m/s and the highest is 7.2 m/s. Based
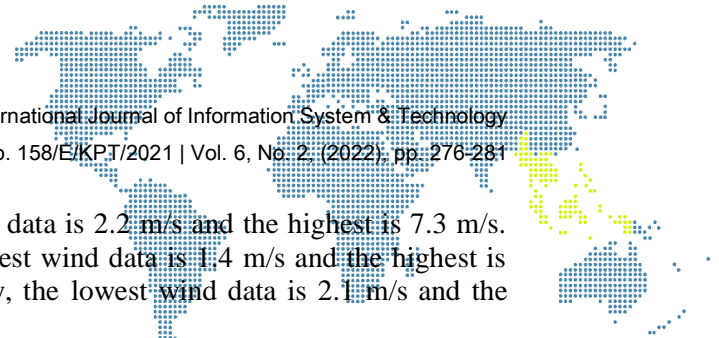
on data collection on the third day, the lowest wind data is 2.2 m/s and the highest is 7.3 m/s. Based on data collection on the fourth day, the lowest wind data is 1.4 m/s and the highest is 6.7 m/s. Based on data collection on the fiveth day, the lowest wind data is 2.1 m/s and the highest is 8.3 m/s.

Table 2. Data Wind Power Min

No	Date	Wind Power Min
1	1-7-2022	1,3 m/s
2	2-7-2022	3,5 m/s
3	3-7-2022	2,2 m/s
4	4-7-2022	1,4 m/s
5	5-7-2022	2,1 m/s

Based on the data that has been collected for 5 days on table 2, the lowest wind strength is 1.3 m/s on 1-7-2022 and the highest is 3.5 m/s on 2-7-2022.

Table 3. Data Wind Power Max

No	Date	Wind Power Max
1	1-7-2022	6,7 m/s
2	2-7-2022	7,2 m/s
3	3-7-2022	7,3 m/s
4	4-7-2022	6,7 m/s
5	5-7-2022	8,3 m/s

Based on the data that has been collected for 5 days on table 3, the highs wind strength is 6.7 m/s on 1-7-2022 and the highest is 8.3 m/s on 5-7-2022.

Table 4. Data Power Watt

No	Date	Day	Temperature	Wind Velocity m/s	Rho kg/m	CP	Power Watt	EA
1	1-7-2022	Friday	31	4	1,225	0,58	278,743	6.853,54
2	2-7-2022	Saturday	32	6	1,225	0,58	963,779	23.130,70
3	3-7-2022	Sunday	31	6	1,225	0,58	963,779	23.130,70
4	4-7-2022	Monday	33	4	1,225	0,58	278,743	6.853,54
5	5-7-2022	Tuesday	34	4	1,225	0,58	278,743	6.853,54

P   = 12 x cp x ρ x v3 x A … (watt)
P   = 0,5 x 0,58 x 1,225 x (4)3 x 3,14 x (2)2
      = 0,29 x 1,225 x 64 x 12,26
      = 0,355 x 64 x 12,26
      = 22,72 x 12,26
      = 278,743 watt

Where :
P   = Active power generated (watt)
Cp   = Power coefficient (58% = 0,58)
V   = Wind velocity (m/s)
A   = The sweep area of the wind turbine blades = area of the circle (m2) (πr2, with assumption 2 m)
ρ   = Air speed (kg/m3)
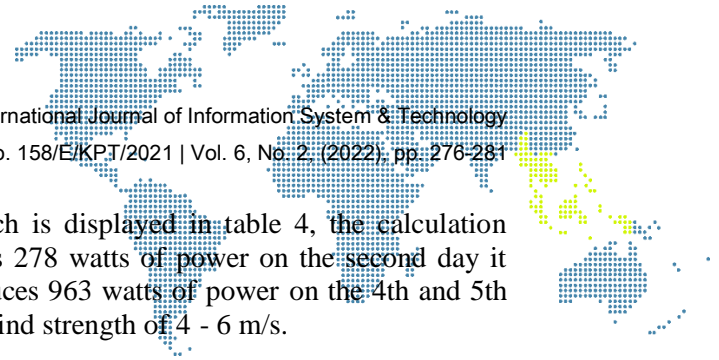
Based on the results of the data collected which is displayed in table 4, the calculation results can be seen that on the first day it produces 278 watts of power on the second day it produces 963 watts of power on the third day produces 963 watts of power on the 4th and 5th day produces 278 watts of power, with an average wind strength of 4 - 6 m/s.

4. Conclusion

Research using direct observation method using secondary and primary data results that wind speed on the Ancol Jakarta has great potential as renewable energy for hydropower. Wind power can touch up to > 250 watts on 5 trials on 5 different days. Based on the data that has been collected for 5 days on table 2, the lowest wind strength is 1.3 m/s on 1-7-2022 and the highest is 3.5 m/s on 2-7-2022. Based on the data that has been collected for 5 days on table 3, the highs wind strength is 6.7 m/s on 1-7-2022 and the highest is 8.3 m/s on 5-7-2022. The potential of the power generated from the Ancol Jakarta coastal wind can be utilized for the needs of public facilities such as street lamps and lighting of public facilities. The point that has great potential is the point facing directly to the Ancol beach, Jakarta. Future research is how to develop existing energy so that it can be used even more and can be developed to power electricity in the wider community.

References

[1]   P. Kaur, "An Study on Current Status and R & D of Wind Energy Technology," vol. 08, no. 03, pp. 581–586, 2021.

[2]   C. Electrode, K. Samoson, P. Thavarungkul, N. M. Electrode, and J. Saichanapan, "Assessment of wind energy potential of Hat Yai (Songkhla), Thailand Assessment of wind energy potential of Hat Yai (Songkhla)," doi: 10.1088/1757-899X/1163/1/012001.

[3]   A. G. Olabi *et al.*, "Selection Guidelines for Wind Energy Technologies," pp. 1–34, 2021.

[4]   S. Canbulat, K. Balci, and O. Canbulat, "Techno-Economic Analysis of On-Site Energy Storage Units to Mitigate Wind Energy Curtailment : A Case Study in Scotland," pp. 1–20, 2021.

[5]   R. J. Barthelmie and S. C. Pryor, "Climate Change Mitigation Potential of Wind Energy," 2021.

[6]   R. Wiser *et al.*, "declines in wind energy costs by 2050," *Nat. Energy*, vol. 6, no. May, 2021, doi: 10.1038/s41560-021-00810-z.

[7]   J. Yang *et al.*, "Review of control strategy of large horizontal-axis wind turbines yaw system," no. November 2019, pp. 97–115, 2021, doi: 10.1002/we.2564.

[8]   I. Karakislak, J. Hildebrand, and P. Schweizer-ries, "Exploring the interaction between social norms and perceived justice of wind energy projects : a qualitative analysis," *J. Environ. Policy Plan.*, pp. 1–14, 2021, doi: 10.1080/1523908X.2021.2020631.

[9]   B. M. Wabukala, J. Otim, and G. Mubiinzi, "Assessing wind energy development in Uganda : Opportunities and challenges," 2021, doi: 10.1177/0309524X20985768.

[10]   Á. M. Costa, J. A. Orosa, and D. Vergara, "applied sciences New Tendencies in Wind Energy Operation and Maintenance," 2021.

[11]   A. S. Putra and H. L. H. S. Warnars, "Intelligent Traffic Monitoring System (ITMS) for Smart City Based on IoT Monitoring," *1st 2018 Indones. Assoc. Pattern Recognit. Int. Conf. Ina. 2018 - Proc.*, pp. 161–165, 2019, doi: 10.1109/INAPR.2018.8626855.

[12]   A. S. Putra, H. L. H. S. Warnars, F. L. Gaol, B. Soewito, and E. Abdurachman, "A Proposed surveillance model in an Intelligent Transportation System (ITS)," *1st 2018*

Indones. Assoc. Pattern Recognit. Int. Conf. Ina. 2018 - Proc., pp. 156–160, 2019, doi: 10.1109/INAPR.2018.8627013.

Authors

1st Author
Kunto Wibowo
Graduated S1 1990 from Gadjahmada University
Graduated S2 2008 at Gunadarma University
Lecturer at Gunadarma University majoring in Electrical Engineering. Joined Univ. Gunadarma in 2000 until now. He has taught in the computer engineering department (2001-2008), informatics engineering (2003-2010), information systems (2002-2013) and now only in the electrical engineering department (2001-until now)
mazkunto@staff.gunadarma.ac.id