NATIONAL INSTITUTE OF WIND ENERGY

WIND RESOURCE ASSESSMENT UNIT

Chennai-600100

REPORT ON WIND MONITORING STUDY AT POOPARA, IDUKKI DISTRICT, KERALA

Final Report

Prepared for

M/s. Agency for Non-Conventional Energy and Rural Technology (ANERT).,

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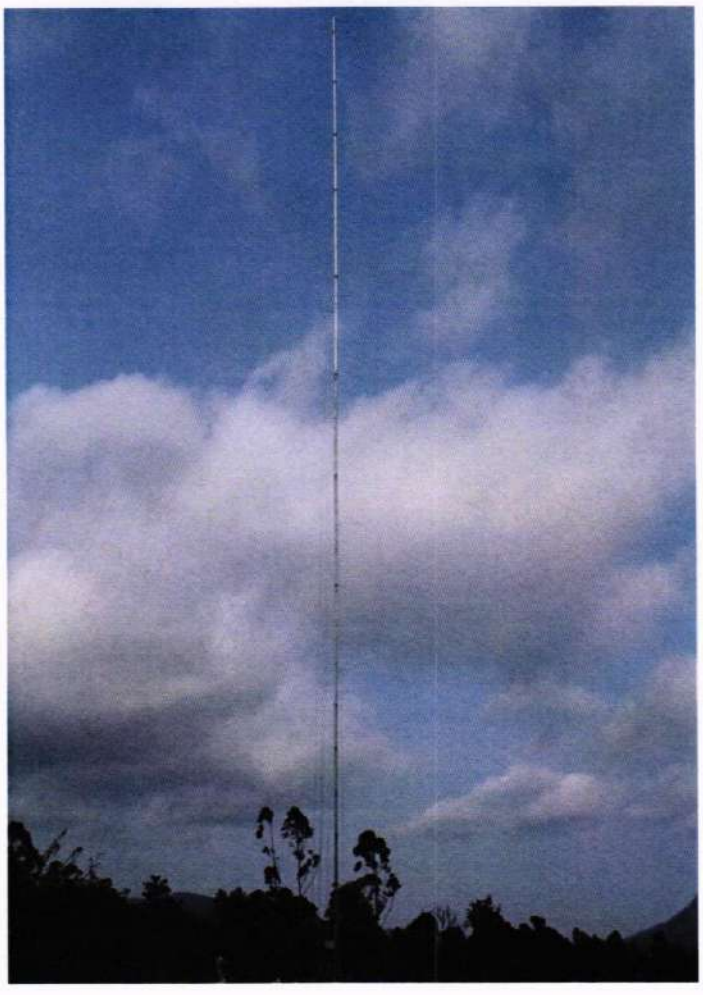
M/s. AGENCY FOR NON-CONVENTIONAL ENERGY AND RURAL TECHNOLOGY, THIRUVANNATHAPURAM



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WIND RESOURCE ASSESSMENT UNIT
NATIONAL INSTITUTE OF WIND ENERGY (NIWE)
Chennai 600 100

July 2017

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EXECUTIVE SUMMARY

Agency for Non-Conventional Energy and Rural Technology (ANERT), Trivandrum vide their letter No. 4431/WRA/ANERT/2009 dated 22.11.2011 had approached National Institute of Wind Energy (NIWE), Chennai for taking up Wind Monitoring study at Poopara , Idukki district, Kerala. This report gives the results of the detailed analysis carried out about the wind characteristics at Poopara, Idukki district, Kerala.

The location Poopara, Idukki was selected for the study in May 2012 based on the Indian Wind atlas. The Wind Monitoring station at the proposed location was commissioned on 16.05.2013 with a 80m tall-guyed tubular mast with instrumentations at 80m south, 78m south, 50m and 20m levels. Wind speed sensors (Anemometer) were fixed at all the four levels mentioned above and the wind direction sensors (wind vane) were fixed at 78m & 48m levels. Two year data collection was completed in the month of May 2015 and the data recovery rate is 98.02%.

Based on the analysis of Two year data collected at Poopara, the Mean Annual Wind Power Density (MAWPD) at 80m level for the period from June 2013 to May 2014 is found to be 125.51 W/m² and June 2014 to May 2015 is found to be 93.04 W/m² respectively. The predominant wind direction is found to be West (W) for both years.

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REPORT ON WIND MONITORING STUDY AT POOPARA, IDUKKI DISTRICT, KERALA

1.0. BACKGROUND

M/s. Agency for Non-Conventional Energy and Rural Technology *(ANERT),* Trivandrum vide their letter no. 4431/WRA/ANERT/2009 dated 22.11.2011 - approached NIWE for a proposal to measure wind characteristics by establishing a Wind Monitoring study at Poopara, Idukki District, Kerala. Based on their request, NIWE submitted a project proposal on 28.09.2012 for the aforesaid study with 80m tall tubular met mast.

A Wind Monitoring Station was commissioned on 16.05.2013 and data collection was carried out till May 2015. This report gives the results of the wind monitoring study carried out for two year.

2.0. OBJECTIVE

- To establish a 80m height wind monitoring station at Poopara, Kerala
- To Collect wind data at various levels for 2 years, analysis of data
- Preparation and submission of wind monitoring study report.

3.0. SITE DESCRIPTION

The site is located at Poopara village, Idukki District-Kerala and is approximately 5kms South West from Senapathi town. The orography of the site is Complex Terrain and the soil type is known to be Alfisols.

The geographical co-ordinates and elevation details of the site are given in the Table 1

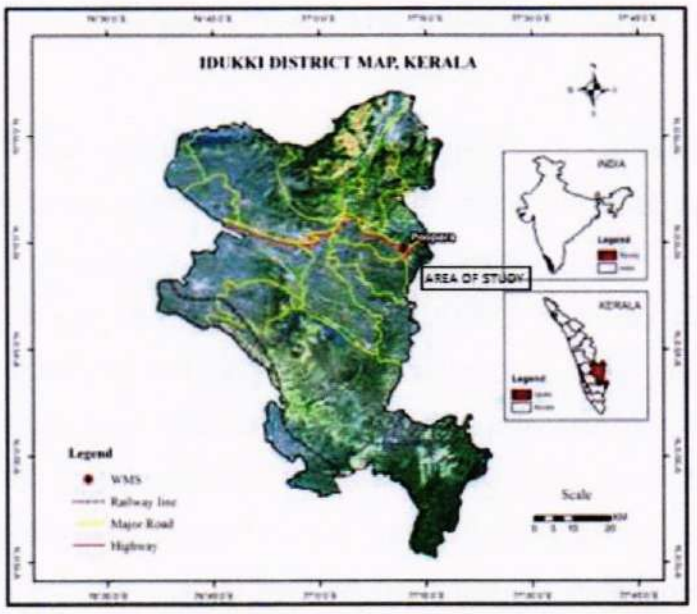

FIGURE 1: DISTRICT MAP OF IDUKKI

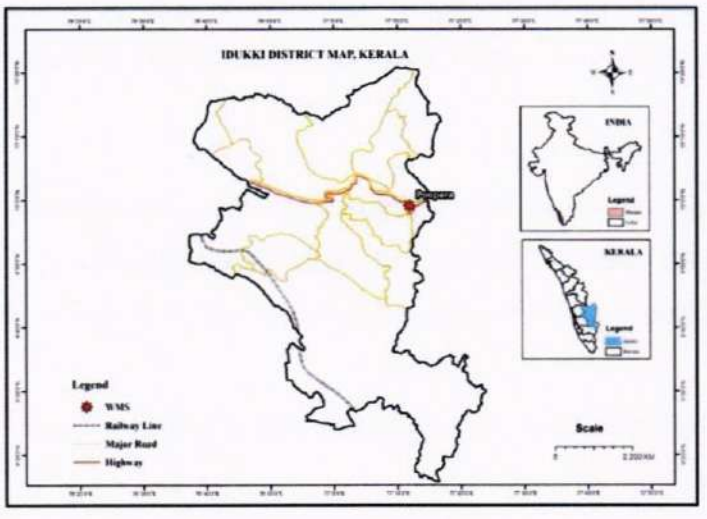

FIGURE.2. MAST LOCATION

TABLE 1: GLOBAL POSITION AND OTHER USEFUL INFORMATION OF POOPARA WIND MONITORING STATION

Latitude	09°59' 09.5" N
Longitude	77°11' 50.0" E
Elevation	1284 m AMSL SOI Topomap No.58-G1
State	Kerala
District	Idukki
Taluk	Idukki
Village	Poopara
Nearest town	Poopara
Nearest Railway station	Palalai
Nearest Airport	Kochi
Orography	Complex Terrain
Soil	Alfisols
Earthquake	Zone II
Land Use	Hilly Area
Physiographic Division	Complex Terrain
Nearest NIWE mast location	SENAPATHI - 5kms aerially towards South West Latitude-09°56'43" Longitude-77°10'23"
Nearest wind farm in operation	Nil

4.0. DESCRIPTION OF THE MASTS &INSTRUMENTATION

A 80m tall guyed tubular wind mast was commissioned on 16.05.2013. A picture of the mast mounting arrangements and a panoramic view taken from the site is presented below (Fig 3).

FIG 3. VIEW OF MET MAST

Anemometer (wind speed sensors) were fixed at 80m south, 78m south, 50m and 20m and the Wind vane (wind direction sensors) were fixed at 78m and 48m levels. The outputs from the sensors were connected to an automatic sophisticated data logger system that was kept at 1.5 m above ground level in locked weather proof housing. The data logger used was imported from M/s. Second Wind Inc., USA. The sensors used were imported

from M/s. NRG systems Inc, USA and the anemometers used were calibrated at M/s. SOHANSEN.DK. Denmark.

The calibration certificates for the instruments used are given in Annexure 3.

TABLE 2: DETAILS OF WIND SENSORS USED IN THE SITE

Sensors	Height	Sensor serial Number	Slope	offset
Anemometer	80m south	179500166153	0.76832	0.30762
	78m south	179500166154	0.76769	0.29677
	50m	179500166157	0.76527	0.31621
	20m	179500166158	0.76479	0.32414
Wind Vane	78m	611	-	-
	48m	612	-	-
Temperature sensor	10m	006	-	-
Pressure Sensor	8m	18179	-	-

5.0. DATA MEASUREMENT

In the data logger, wind speed and directions were sampled at 1 sec and 10 minutes average values were logged. Analysis was performed with 10 minutes average data as per International Electro technical Commission (IEC) standard. Data was stored in removable storage devices (Compact Flash Card) which were collected once in a month regularly by NIWE along with the battery replacement. Data was manually validated to remove outlier events due to failed instruments and repeated values. Periodic quality check

on the data was also carried out to avoid incorrectness in the computation and analysis. The collected data was compiled and interim report was sent to the client regularly as per the terms and conditions prescribed in the project proposal.

Monthly and Daily Mean Wind Speed values for the four heights (20m, 50m, 78m south and 80m south) are shown in Figure 8 of Annexure-1.

6.0. DETAILS OF DATA ANALYSED

The Wind Monitoring Station was commissioned at Poopara, Idukki as per the project terms & conditions and two-year data collection was completed in the month of May 2015. As the data collection at the location was for two year, the customer had been informed by NIWE in June 2015 that the data collection would be completed and terminates in the month of June 2015.

Analysis of the wind data has been performed using Mat lab, MS Excel and Windographer. The data have been checked for quality & correctness, analyzed and details of the analysis / results are given in Annexure-1. The consolidated annual wind data and wind data summary tables for the wind characteristics at Poopara are given in Table 4 and Table 5 respectively of Annexure-1.

Mean Hourly Wind Speed, Monthly Mean Wind Speed and Monthly Wind Power Density values are shown graphically in Figure 4 to 6 of Annexure-1. The Mean Hourly Wind Speed tables for the four heights viz., 20m, 50m, 78m south and 80m south are given in Table 6, 6A, 6B & 6C of Annexure-1. The graphical representations for the same are given in Figure 4, 4A and 4B of Annexure-1.

7.0. RESULTS

The data recovery rate is 98.02% for the period of measurement. The comparative details of various parameters are as follows

Year	Mean Annual Wind Power Density(W/m^2)			
	At height 20m (AGL)	At height 50m (AGL)	At height 78m south (AGL)	At height 80m south (AGL)
2013-2014	82.52	119.77	131.19	125.51
2014-2015	55.14	86.02	92.73	93.04

Year	Mean Annual Wind Speed (m/s)			
	At height 20m (AGL)	At height 50m (AGL)	At height 78m south (AGL)	At height 80m south (AGL)
2013-2014	3.85	4.50	4.62	4.60
2014-2015	3.51	4.17	4.25	4.53

Year	Mean Annual		
	Temperature ^{0} C	Air density Kg/m^3	Power law
2013-2014	19.03	1.045	0.13
2014-2015	19.38	1.043	0.20

7.1. WIND FREQUENCY DISTRIBUTION

A common method of displaying a year wind data is by wind frequency distribution, which shows the percentage of time that each wind speed occurs. Table 7, 7A, 7B and 7C of Annexure-1 show the month wise percentage frequency distribution for the four measurement heights viz., 20m, 50m, 78m south and 80m south.

Joint frequency distribution is another way to display the data, where the wind is classified by speed and also by direction. Table 8, 8A and 8B of Annexure-1 shows the joint frequency distribution for 50m, 78m south and 80m south heights.

7.2. WIND ROSE

Two wind vanes have been installed at the site to measure the 10 minutes mean values of the wind direction. Monthly and Annual wind roses have been calculated to show the predominant wind direction at all the three heights. Figure 7, 7A, 7B & 7C of Annexure-1 shows the monthly wind roses at 80m south, 78m south and 50m heights. From the wind roses, it is revealed that the wind is flowing predominantly from West (W) direction.

7.3. WIND SHEAR PROFILE

The wind shear profile at the site is useful to understand the wind speed variation with height. Figure 9 & 10 of Annexure-1 shows the Daily wind shear and Monthly wind shear profiles. The Vertical wind shear profile based on the measured data is given in Figure 11 of Annexure-1.

7.4. TURBULENCE INTENSITY (TI):

Turbulence Intensity is the basic measure of the turbulence of wind. Typically, 10% of TI is desired for minimal wear of wind turbine components. The turbulence intensity related graphs are shown in Figure 12 of Annexure-1.

The Mean Turbulence Intensity for the period of June 2013 to May 2014

(at 80m AGL) at 15m/s is 0.27 (27%) and June 2014 to May 2015 (at 80m AGL) at 15m/s is 0.27 (27%).

7.5. LONG TERM DATA FOR THE STUDY AREA

MERRA (The Modern Era Retrospective-Analysis for Research and Applications) data have been made available for the site as Table-4 and Figure-6. The latitude and longitude of the MERRA grid point nearby the study site is given below. This information gives the wind pattern during the period of Jan 2005 to July 2015 at 50m AMSL in the region of interest. This reanalysis data is helpful in understanding the long term variability of wind speed in the region of interest.

Latitude Range: 09° 59' 09.5"
Longitude Range: 077° 11' 50.0"
**AMSL – Above Mean Sea Level*

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
2005	2.9	3.0	2.3	1.9	3.2	6.2	6.6	5.7	5.5	2.8	3.2	3.1	3.9
2006	3.6	3.4	1.8	2.1	4.4	5.5	6.9	5.8	4.5	3.2	2.8	4.2	4.0
2007	4.1	3.0	2.4	1.7	4.1	5.7	6.1	5.3	5.1	3.2	2.6	4.1	4.0
2008	3.3	2.7	3.0	2.2	4.4	5.9	5.9	4.8	4.9	2.8	2.8	3.6	3.9
2009	3.5	3.1	2.3	2.9	4.1	6.3	7.0	5.1	5.1	3.2	3.1	3.5	4.1
2010	3.3	2.6	2.7	2.1	3.9	6.0	6.2	5.9	3.9	3.8	2.4	3.1	3.9
2011	3.6	2.7	2.5	2.1	4.1	6.2	6.2	5.9	5.1	2.7	3.2	3.6	4.0
2012	3.3	3.4	2.6	2.3	4.3	6.0	6.0	5.5	4.9	3.2	2.7	4.1	4.0
2013	3.5	3.3	2.8	2.2	4.0	6.8	7.0	5.2	5.0	3.4	2.7	3.4	4.1
2014	3.4	2.6	2.8	2.2	3.2	6.1	6.8	5.5	4.3	2.5	3.3	3.5	3.9
2015	2.9	2.9	2.5	1.8	3.0								2.6
						AVG							3.9

TABLE 3: MERRA REANALYSIS DATA FOR POOPARA, KERALA (JANUARY 2005 – MAY 2015)

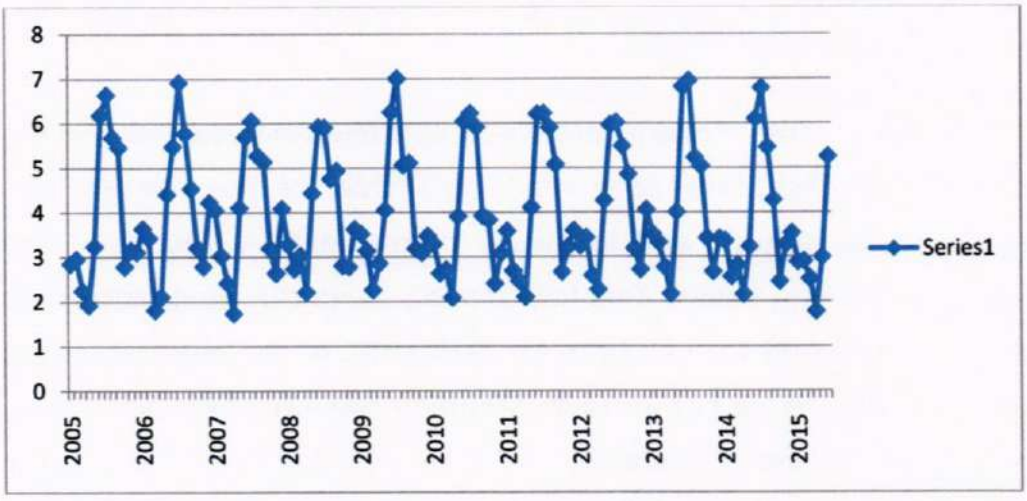

FIGURE.3A. MERRA REANALYSIS DATA FOR POOPARA, KERALA (JANUARY 2005 – MAY 2015)

8.0. CONCLUSION

Based on the analysis of Two year data collected at Poopara, the Mean Annual Wind Power Density (MAWPD) at 80m level for the period from July 2013 to May 2014 is found to be 125.51 W/m^2 and July 2014 to May 2015 is found to be 93.04 W/m^2.

The monthly average wind speed at 80m level for the period from July 2013 to May 2014 is found to be 4.60 m/s and July 2014 to May 2015 is found to be 4.53 m/s. The predominant wind direction is found to be West for both years.

It has been observed from the analysis and the computation of WPD at 80m level, that the site is not having promising wind power potential for the development of large-scale wind power projects at the area of interest.

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2013 - 2015

Annexure - 1

Data (Tables & Figures)

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POOPARA

STATE	:	KERALA
DISTRICT	:	IDUKKI
TALUK	:	IDUKKI
VILLAGE	:	POOPARA
LATITUDE	:	09° 59' 09.5" N
LONGITUDE	:	077° 11' 50.0" E
ELEVATION	:	1284M AMSL
INSTRUMENTS USED	:	NOMAD-2
PERIOD OF DATA	:	JUNE 2013 to MAY 2015
COMMISSIONED ON	:	16.05.2013
MAST HEIGHT	:	80m
MEASURED WIND SPEED AT 80m south AGL (JUNE 2013 to MAY 2014)	:	4.60 m/s
MEASURED WIND SPEED AT 78m south AGL (JUNE 2013 to MAY 2014)	:	4.62 m/s
MEASURED WIND SPEED AT 50m AGL (JUNE 2013 to MAY 2014)	:	4.50 m/s
MEASURED WIND POWER DENSITY AT 80m south AGL (JUNE 2013 to MAY 2014)	:	125.51 W/m^2
MEASURED WIND POWER DENSITY AT 78m south AGL (JUNE 2013 to MAY 2014)	:	131.19 W/m^2
MEASURED WIND POWER DENSITY AT 50m AGL (JUNE 2013 to MAY 2014)	:	119.71 W/m^2
MEASURED WIND SPEED AT 80m south AGL (JUNE 2014 to MAY 2015)	:	4.53 m/s

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MEASURED WIND SPEED AT 78m south AGL (JUNE 2014 to MAY 2015)	:	***4.25 m/s***
MEASURED WIND SPEED AT 50m AGL (JUNE 2014 to MAY 2015)	:	***4.17 m/s***
MEASURED WIND POWER DENSITY AT 80m south AGL (JUNE 2014 to MAY 2015)	:	***93.04 W/m²***
MEASURED WIND POWER DENSITY AT 78m south AGL (JUNE 2014 to MAY 2015)	:	***92.73 W/m²***
MEASURED WIND POWER DENSITY AT 50m AGL (JUNE 2014 to MAY 2015)	:	***86.02 W/m²***
SOI TOPO MAP NUMBER	:	***58-G1***

Ist Year

Jun 2013 - May 2014

POOPARA

TABLE 4
CONSOLIDATED TABLE

	JAN-14	FEB-14	MAR-14	APR-14	MAY-14	JUN-13	JUL-13	AUG-13	SEP-13	OCT-13	NOV-13	DEC-13	ANNUAL
Monthly Mean Wind Speed (m/s)													
20m	3.49	3.12	3.77	2.57	2.87	5.85	6.17	4.44	4.57	3.50	2.74	3.13	3.85
50m	4.57	3.95	5.14	3.02	3.08	6.63	6.97	4.92	4.95	3.68	3.24	3.79	4.50
78 m	4.66	4.10	5.48	3.04	3.06	7.04	7.30	5.12	5.12	3.80	3.18	3.58	4.62
80m	4.73	4.08	5.40	3.10	3.17	6.85	7.14	5.06	5.03	3.75	3.14	3.69	4.60
Monthly Wind Power Density (Watts/Sq.m)													
20m	61.80	24.76	44.84	18.42	31.18	174.06	211.91	115.61	189.90	46.08	42.22	29.44	82.52
50m	79.64	56.76	119.51	37.21	46.43	235.69	278.07	142.79	235.52	54.16	88.91	62.55	119.77
78 m	90.21	66.43	142.52	41.01	52.34	258.93	295.13	151.45	250.67	58.41	100.93	66.26	131.19
80m	90.57	64.79	139.17	40.79	52.24	242.39	277.87	143.79	236.84	55.54	95.87	66.28	125.51
Power Law Index (PLI)													
	0.22	0.19	0.26	0.14	0.07	0.11	0.11	0.09	0.07	0.05	0.10	0.12	0.13
Energy Pattern Factor													
20m	1.46	1.57	1.62	2.07	2.37	1.67	1.73	2.55	1.99	2.07	2.06	1.84	1.92
50m	1.60	1.77	1.70	2.60	2.87	1.56	1.58	2.31	1.95	2.09	2.62	2.20	2.07
78 m	1.71	1.86	1.68	2.78	3.30	1.43	1.46	2.17	1.86	2.05	3.15	2.78	2.19
80m	1.65	1.84	1.71	2.63	2.96	1.45	1.47	2.14	1.86	2.03	3.09	2.52	2.11
Air Density (kg/m^3)													
	1.043	1.036	1.032	1.045	1.110	1.039	1.041	1.040	1.040	1.039	1.038	1.042	1.045
Temperature (^{0} C)													
	18.60	20.07	21.56	--	--	18.28	17.89	18.45	18.53	19.03	19.53	18.35	19.03
Turbulance Intensity (at 80m agl)													
	At 15m/s : 0.27												
Data Availability (Based on 10 Minutes Interval)													
	4464	4032	4464	4320	4419	4320	4464	4464	4320	4464	4320	4464	

Based on Data June 2013 to May 2014

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TABLE 5

SUMMARY OF WIND DATA

Monthly Mean wind speed (m/s)			Monthly standard Deviation (m/s)			Peak wind speed(m/s) (date/year/Time of occurance)			Prevailing wind Direction	
(50m)	(80m)	(78m)	(50m)	(80m)	(78m)	(50m)	(80m)	(78m)	(50m)	(80m)
4.57	4.73	4.66	0.92	0.87	0.89	12.53 1/8/2014 7:20	12.50 1/8/2014 7:20	12.69 1/8/2014 7:20	W	W
3.95	4.08	4.10	0.80	0.76	0.77	11.29 2/2/2014 00:40	11.55 2/2/2014 00:40	11.97 2/2/2014 00:40	W	W
5.14	5.40	5.48	1.00	0.95	0.95	13.44 3/16/2014 3:00	14.47 3/16/2014 3:00	14.53 3/16/2014 3:00	W	W
3.02	3.10	3.04	0.68	0.65	0.65	15.88 4/24/2014 15:30	15.86 4/24/2014 15:30	16.08 4/24/2014 15:30	W	W
3.08	3.17	3.06	0.74	0.73	0.74	14.08 5/6/2014 23:00	14.74 5/6/2014 23:00	14.83 5/6/2014 23:00	W	W
6.63	6.85	7.04	1.83	1.85	1.87	18.06 6/8/2013 20:50	17.89 6/8/2013 20:50	18.24 6/8/2013 20:50	NE	NE
6.97	7.14	7.30	1.93	1.94	1.97	17.79 7/24/2013 12:50	17.99 7/24/2013 12:50	18.35 7/24/2013 12:50	NNE	NNE
4.92	5.06	5.12	1.20	1.19	1.23	18.42 8/1/2013 8:40	18.48 8/1/2013 8:40	18.87 8/1/2013 8:40	SE	E
4.95	5.03	5.12	1.22	1.22	1.24	14.64 9/20/2013 22:20	14.45 9/20/2013 14:30	14.78 9/20/2013 14:30	NNE	NE
3.68	3.75	3.80	0.84	0.85	0.87	10.95 10/9/2013 00:00	11.19 10/9/2013 00:00	11.37 10/9/2013 00:00	E	NE
3.24	3.14	3.18	0.72	0.71	0.72	13.79 11/4/2013 3:40	14.11 11/4/2013 3:40	14.31 11/4/2013 3:40	NE	NE
3.79	3.69	3.58	0.76	0.73	0.76	12.94 12/24/2013 1:20	12.75 12/12/2013 22:00	12.88 12/12/2013 22:00	NNE	NNE
4.50	**4.60**	**4.62**	**1.05**	**1.04**	**1.06**	**18.42 8/1/2013 8:40**	**18.48 8/1/2013 8:40**	**18.87 8/1/2013 8:40**	**W**	**W**

Based on Data June 2013 to May 2014

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TABLE 6

POOPARA **MEAN HOURLY WIND SPEED**

MONTH	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	3.70	3.84	3.64	3.63	4.17	5.19	5.80	6.37	6.47	6.36	6.15	5.82	5.51	4.84	4.62	4.53	4.42	4.71	4.34	4.23	4.06	3.67	3.71	3.65	4.73
FEB	3.97	3.82	3.67	3.06	3.49	4.42	4.87	4.98	5.20	5.22	5.07	4.96	4.81	4.22	3.63	3.92	4.24	3.87	3.42	3.35	3.58	3.43	3.29	3.39	4.08
MAR	5.04	5.08	5.10	4.86	5.28	5.66	6.26	6.82	6.80	6.95	6.54	5.89	5.41	5.38	5.31	5.61	5.69	4.63	4.21	4.17	4.45	4.50	4.94	5.00	5.40
APR	1.80	1.87	1.72	1.76	2.74	3.52	4.32	4.87	5.47	5.43	5.49	4.65	3.70	3.53	3.49	3.07	2.91	2.67	2.17	2.24	1.73	1.74	1.70	1.72	3.10
MAY	1.93	1.93	2.07	2.47	3.10	3.69	4.47	5.09	5.15	5.06	4.75	4.39	4.20	3.60	3.36	3.23	2.66	2.61	2.38	1.98	1.91	1.92	1.82	1.95	3.16
JUN	6.32	6.35	5.93	6.49	7.49	7.61	7.92	8.13	8.07	7.99	7.35	7.37	6.75	6.45	6.06	6.10	6.91	6.65	6.16	6.38	6.59	6.42	6.50	6.37	6.85
JUL	7.03	6.47	6.54	6.71	7.25	7.25	8.10	8.09	7.62	7.86	7.53	8.06	7.15	7.17	6.34	6.49	6.58	6.83	6.85	7.09	7.14	6.85	7.13	7.24	7.14
AUG	4.18	4.05	3.65	4.00	4.62	5.92	6.50	7.03	7.17	7.27	7.23	6.56	6.06	5.37	4.84	4.47	4.26	4.32	4.15	3.97	4.07	3.89	4.00	3.84	5.06
SEP	3.50	3.31	2.80	3.54	4.47	5.33	6.21	6.68	6.94	7.04	6.49	6.18	5.45	4.70	4.50	3.93	3.79	3.63	3.59	3.67	3.62	3.41	3.47	3.33	4.57
OCT	3.15	2.57	2.26	2.63	4.07	4.88	5.54	5.95	6.18	5.67	4.94	4.50	4.08	3.74	3.44	3.30	3.04	2.83	2.93	2.75	2.67	2.71	2.84	3.27	3.75
NOV	2.95	2.92	2.71	2.69	3.28	3.82	3.99	4.08	4.19	4.09	3.96	3.75	2.72	2.28	2.58	2.87	2.93	2.96	2.94	2.52	2.67	2.87	2.75	2.91	3.14
DEC	3.03	2.74	2.30	2.86	3.66	4.42	4.82	4.87	4.83	5.01	5.11	4.83	4.00	3.06	2.77	3.28	3.51	3.66	3.58	3.57	3.56	3.24	2.81	3.14	3.69
Annual	3.88	3.75	3.53	3.72	4.47	5.14	5.73	6.08	6.17	6.16	5.88	5.58	4.99	4.53	4.24	4.23	4.25	4.11	3.89	3.83	3.84	3.72	3.75	3.82	4.55

SENSOR HEIGHT: 80m

Based on Data June 2013 to May 2014

TABLE 6A

POOPARA

MEAN HOURLY WIND SPEED

MONTH	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	3.55	3.72	3.53	3.59	4.16	5.22	5.83	6.38	6.47	6.37	6.16	5.82	5.49	4.77	4.54	4.43	4.32	4.61	4.27	4.14	3.93	3.56	3.57	3.49	4.66
FEB	3.97	3.82	3.67	3.06	3.49	4.42	4.87	4.98	5.20	5.22	5.07	4.96	4.81	4.22	3.63	3.92	4.24	3.87	3.42	3.35	3.58	3.43	3.29	3.39	4.08
MAR	5.17	5.20	5.25	5.03	5.41	5.75	6.33	6.87	6.81	6.95	6.53	5.89	5.42	5.40	5.35	5.63	5.71	4.72	4.34	4.34	4.59	4.64	5.10	5.15	5.48
APR	1.70	1.79	1.64	1.74	2.75	3.54	4.35	4.90	5.49	5.44	5.50	4.66	3.69	3.48	3.38	2.96	2.77	2.54	2.05	2.13	1.65	1.65	1.62	1.64	3.04
MAY	1.77	1.79	1.94	2.34	3.04	3.65	4.46	5.12	5.17	5.06	4.70	4.33	4.11	3.48	3.21	3.08	2.53	2.42	2.17	1.79	1.73	1.71	1.62	1.78	3.04
JUN	6.51	6.54	6.14	6.70	7.68	7.80	8.10	8.31	8.23	8.15	7.52	7.54	6.92	6.62	6.24	6.30	7.12	6.85	6.36	6.58	6.78	6.61	6.71	6.57	7.04
JUL	7.18	6.62	6.68	6.89	7.42	7.42	8.26	8.26	7.78	8.03	7.70	8.23	7.30	7.33	6.49	6.66	6.74	6.98	7.01	7.24	7.30	7.00	7.28	7.40	7.30
AUG	4.22	4.09	3.67	4.05	4.69	6.00	6.59	7.14	7.29	7.40	7.35	6.66	6.16	5.45	4.90	4.51	4.31	4.36	4.19	4.01	4.10	3.92	4.05	3.87	5.12
SEP	3.79	3.50	3.08	3.77	4.77	5.68	6.58	7.09	7.37	7.53	6.94	6.64	5.88	5.20	4.96	4.32	4.15	4.02	3.98	4.00	4.04	3.88	3.87	3.67	4.95
OCT	3.19	2.60	2.31	2.65	4.13	4.95	5.63	6.05	6.29	5.77	5.04	4.58	4.13	3.81	3.48	3.34	3.07	2.86	2.96	2.78	2.69	2.73	2.86	3.30	3.80
NOV	2.99	2.97	2.78	2.74	3.34	3.86	4.04	4.13	4.24	4.13	4.00	3.76	2.73	2.31	2.60	2.88	2.93	2.98	2.96	2.52	2.71	2.90	2.79	2.96	3.18
DEC	2.84	2.51	2.07	2.80	3.64	4.43	4.85	4.90	4.84	5.01	5.09	4.80	3.89	2.89	2.55	3.11	3.34	3.51	3.42	3.41	3.41	3.04	2.57	2.93	3.58
Annual	3.91	3.76	3.56	3.78	4.54	5.23	5.83	6.18	6.27	6.26	5.97	5.66	5.04	4.58	4.28	4.26	4.27	4.14	3.93	3.86	3.88	3.76	3.78	3.84	4.61

SENSOR HEIGHT: 78m

Based on Data June 2013 to May 2014

NATIONAL INSTITUTE OF WIND ENERGY
CHENNAI

TABLE 6B

POOPARA **MEAN HOURLY WIND SPEED**

MONTH	OO	O1	O2	O3	O4	O5	O6	O7	O8	O9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	3.70	3.85	3.52	3.39	4.11	5.11	5.67	6.17	6.28	6.22	6.04	5.65	5.24	4.60	4.39	4.22	4.17	4.37	4.06	4.10	3.88	3.67	3.67	3.58	4.57
FEB	3.93	3.76	3.64	2.93	3.44	4.36	4.83	4.96	5.19	5.19	5.04	4.89	4.56	3.93	3.31	3.57	3.79	3.66	3.25	3.23	3.56	3.33	3.17	3.37	3.95
MAR	4.89	5.05	4.93	4.67	5.14	5.45	6.01	6.57	6.51	6.66	6.25	5.54	5.05	4.96	5.04	5.30	5.23	4.37	4.02	3.96	4.12	4.20	4.74	4.73	5.14
APR	1.79	1.98	1.65	1.66	2.76	3.49	4.31	4.83	5.43	5.35	5.29	4.53	3.57	3.43	3.29	2.85	2.58	2.47	2.07	2.08	1.68	1.84	1.72	1.72	3.02
MAY	1.81	1.79	1.96	2.34	3.11	3.68	4.46	5.09	5.13	4.96	4.65	4.25	4.03	3.49	3.27	3.09	2.55	2.40	2.22	1.87	1.77	1.88	1.80	1.83	3.06
JUN	5.96	5.91	5.63	6.36	7.58	7.67	7.99	8.22	8.05	7.96	7.32	7.30	6.63	6.20	5.74	5.75	6.61	6.36	5.75	5.98	6.13	5.99	6.14	5.94	6.63
JUL	6.78	6.12	6.19	6.65	7.22	7.29	8.16	8.18	7.59	7.89	7.55	7.97	7.03	7.02	6.08	6.26	6.34	6.46	6.55	6.80	6.83	6.52	6.85	6.96	6.97
AUG	3.86	3.73	3.33	3.92	4.68	5.94	6.56	7.14	7.29	7.29	7.19	6.55	6.08	5.30	4.68	4.26	4.06	4.07	3.80	3.65	3.77	3.66	3.72	3.47	4.92
SEP	3.86	3.72	3.42	3.89	4.83	5.74	6.65	7.16	7.44	7.59	6.99	6.75	5.99	5.40	5.19	4.55	4.37	4.26	4.27	4.24	4.34	4.19	4.19	3.91	5.12
OCT	2.87	2.30	2.10	2.65	4.19	5.01	5.68	6.04	6.21	5.70	4.94	4.51	4.05	3.67	3.35	3.21	2.99	2.74	2.85	2.66	2.54	2.57	2.60	2.95	3.68
NOV	3.09	3.10	2.79	2.78	3.36	3.85	3.99	4.13	4.28	4.12	4.00	3.74	2.74	2.38	2.69	2.90	3.05	3.06	3.03	2.65	2.83	3.04	3.01	3.06	3.24
DEC	3.29	3.08	2.57	2.80	3.76	4.49	4.92	4.93	4.87	5.01	5.08	4.79	3.94	3.11	2.82	3.39	3.57	3.79	3.72	3.64	3.65	3.38	2.96	3.43	3.79
Annual	3.82	3.70	3.48	3.67	4.52	5.17	5.77	6.12	6.19	6.16	5.86	5.54	4.91	4.46	4.15	4.11	4.11	4.00	3.80	3.74	3.76	3.69	3.71	3.74	4.51

SENSOR HEIGHT : 50m

Based on Data June 2013 to May 2014

NATIONAL INSTITUTE OF WIND ENERGY
CHENNAI

TABLE 6C

POOPARA **MEAN HOURLY WIND SPEED**

MONTH	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	3.02	3.27	2.91	2.63	3.14	4.00	4.31	4.70	4.71	4.63	4.41	4.01	3.65	3.36	3.25	3.11	3.15	3.19	3.03	3.18	3.09	2.99	3.03	2.93	3.49
FEB	3.21	3.08	2.96	2.31	2.79	3.60	4.02	4.21	4.31	4.23	3.96	3.71	3.20	2.85	2.52	2.57	2.72	2.66	2.48	2.59	2.88	2.68	2.56	2.82	3.12
MAR	3.75	4.06	3.91	3.56	3.87	4.10	4.40	4.75	4.65	4.66	4.38	3.84	3.53	3.44	3.58	3.72	3.57	3.20	3.02	2.95	3.10	3.24	3.62	3.54	3.77
APR	1.86	2.12	1.68	1.51	2.52	3.08	3.63	3.92	4.34	4.25	4.03	3.62	3.02	2.91	2.59	2.30	2.01	1.98	1.80	1.81	1.62	1.79	1.65	1.69	2.57
MAY	1.88	1.87	1.90	2.28	3.02	3.56	4.18	4.68	4.72	4.46	4.16	3.76	3.56	3.18	2.99	2.75	2.33	2.18	2.05	1.80	1.73	1.80	1.82	1.84	2.85
JUN	5.13	5.03	4.85	5.68	6.88	6.90	7.23	7.49	7.34	7.14	6.50	6.54	5.87	5.41	4.96	4.95	5.84	5.59	4.95	5.18	5.32	5.22	5.31	5.11	5.85
JUL	5.96	5.30	5.35	5.92	6.45	6.50	7.40	7.44	6.79	7.12	6.80	7.18	6.26	6.28	5.32	5.48	5.60	5.58	5.73	5.95	5.97	5.64	6.01	6.06	6.17
AUG	3.29	3.16	2.78	3.55	4.38	5.55	6.09	6.72	6.82	6.84	6.64	6.01	5.59	4.76	4.14	3.77	3.54	3.56	3.28	3.15	3.31	3.27	3.27	2.98	4.44
SEP	3.79	3.66	3.35	3.81	4.73	5.61	6.53	7.04	7.31	7.46	6.86	6.63	5.89	5.31	5.10	4.47	4.30	4.21	4.20	4.17	4.27	4.12	4.10	3.84	5.03
OCT	2.58	2.21	2.02	2.68	4.17	4.92	5.54	5.87	5.93	5.39	4.69	4.31	3.81	3.34	3.10	2.99	2.91	2.58	2.70	2.58	2.47	2.51	2.43	2.64	3.52
NOV	2.71	2.72	2.38	2.34	2.83	3.30	3.48	3.53	3.59	3.39	3.24	2.94	2.21	2.01	2.25	2.34	2.48	2.55	2.55	2.24	2.47	2.70	2.70	2.76	2.74
DEC	2.90	2.88	2.38	2.27	3.13	3.82	4.16	4.17	4.08	4.11	4.05	3.70	3.01	2.48	2.27	2.76	2.79	3.00	3.00	2.97	2.96	2.70	2.55	3.02	3.13
Annual	3.34	3.28	3.04	3.21	3.99	4.58	5.08	5.38	5.38	5.31	4.98	4.69	4.13	3.78	3.50	3.44	3.44	3.36	3.23	3.22	3.27	3.22	3.25	3.27	3.89

SENSOR HEIGHT : 20m

Based on Data June 2013 to May 2014

TABLE 7

POOPARA

PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	ANNUAL
0.0-1.0	3.05	7.32	4.41	16.20	16.02	1.37	0.69	9.30	6.94	8.87	12.20	8.13	7.88
1.0-2.0	10.73	14.29	10.82	22.31	21.54	4.05	3.70	11.00	9.70	15.53	21.92	16.71	13.53
2.0-3.0	22.92	23.14	17.32	23.68	21.07	9.10	10.17	13.40	12.73	20.24	26.60	22.94	18.61
3.0-4.0	27.82	29.39	24.08	20.76	15.34	13.33	12.14	15.66	15.39	21.18	20.60	25.18	20.07
4.0-5.0	22.67	17.76	21.77	11.25	11.56	14.38	13.08	14.09	15.19	12.62	11.83	17.18	15.28
5.0-6.0	9.68	6.32	12.48	4.26	8.69	13.33	12.16	11.85	12.45	8.85	3.75	6.41	9.19
6.0-7.0	2.46	1.51	5.42	1.23	3.78	11.88	11.40	8.83	9.63	6.25	1.81	1.72	5.49
7.0-8.0	0.52	0.27	2.15	0.21	1.18	10.76	10.93	6.59	7.80	4.12	0.79	0.69	3.83
8.0-9.0	0.04	0.00	1.19	0.00	0.52	8.43	8.85	2.96	4.68	1.66	0.37	0.47	2.43
9.0-10.0	0.07	0.00	0.36	0.05	0.23	5.53	5.67	1.79	2.82	0.58	0.05	0.38	1.46
10.0-11.0	0.04	0.00	0.00	0.00	0.05	3.89	3.97	1.23	1.71	0.09	0.07	0.13	0.93
11.0-12.0	0.00	0.00	0.00	0.00	0.00	2.59	3.11	0.74	0.63	0.00	0.02	0.04	0.59
12.0-13.0	0.00	0.00	0.00	0.02	0.02	0.76	2.08	1.01	0.25	0.00	0.00	0.00	0.35
13.0-14.0	0.00	0.00	0.00	0.02	0.00	0.44	1.41	0.54	0.07	0.00	0.00	0.00	0.21
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.07	0.43	0.40	0.00	0.00	0.00	0.00	0.07
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.05	0.16	0.40	0.00	0.00	0.00	0.00	0.05
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.20	0.00	0.00	0.00	0.00	0.02
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 20m **Based on Data June 2013 to May 2014**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

TABLE 7A

POOPARA

PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	ANNUAL
0.0-1.0	2.62	6.50	4.23	19.70	20.71	1.02	0.22	7.71	7.64	12.57	16.06	9.52	9.04
1.0-2.0	7.48	10.24	7.26	16.13	17.04	2.11	1.43	7.91	7.48	10.62	16.09	13.66	9.79
2.0-3.0	13.96	15.67	10.28	18.77	16.56	5.97	5.35	10.80	9.58	16.63	18.94	15.97	13.21
3.0-4.0	17.38	19.39	13.04	14.86	13.17	9.75	10.13	14.07	13.54	18.20	17.31	18.79	14.97
4.0-5.0	16.98	20.44	13.26	12.13	12.76	12.92	12.14	15.05	14.98	15.53	11.88	15.82	14.49
5.0-6.0	16.51	12.67	13.91	9.70	9.75	12.55	12.46	14.09	13.63	11.16	8.43	10.93	12.15
6.0-7.0	12.32	7.59	13.60	4.81	5.11	12.43	12.01	10.19	11.27	7.51	5.00	6.81	9.05
7.0-8.0	7.53	5.06	11.63	2.62	2.29	11.60	11.07	8.18	7.80	4.75	3.06	3.99	6.63
8.0-9.0	3.92	1.61	6.88	0.83	1.13	10.39	10.57	4.46	6.16	2.17	1.60	2.13	4.32
9.0-10.0	1.01	0.64	3.41	0.32	0.66	8.45	8.49	1.95	3.24	0.74	1.00	1.08	2.58
10.0-11.0	0.20	0.15	1.84	0.02	0.43	5.76	5.47	1.41	2.71	0.11	0.42	0.54	1.59
11.0-12.0	0.07	0.02	0.60	0.00	0.16	3.89	4.30	0.94	1.32	0.00	0.12	0.54	1.00
12.0-13.0	0.02	0.00	0.02	0.00	0.18	1.99	3.20	1.08	0.46	0.00	0.05	0.22	0.60
13.0-14.0	0.00	0.00	0.04	0.05	0.02	0.74	1.81	0.72	0.14	0.00	0.07	0.00	0.30
14.0-15.0	0.00	0.00	0.00	0.02	0.02	0.30	0.83	0.52	0.05	0.00	0.00	0.00	0.14
15.0-16.0	0.00	0.00	0.00	0.02	0.00	0.05	0.36	0.58	0.00	0.00	0.00	0.00	0.08
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.05	0.13	0.18	0.00	0.00	0.00	0.00	0.03
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.16	0.00	0.00	0.00	0.00	0.02
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 50m **Based on Data June 2013 to May 2014**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

TABLE 7B

POOPARA

PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	ANNUAL
0.0-1.0	5.40	7.12	3.45	22.82	25.96	0.46	0.04	7.28	8.54	12.95	22.92	19.47	11.37
1.0-2.0	7.57	10.29	6.88	14.88	14.46	0.83	0.36	6.16	5.65	9.86	14.56	12.03	8.63
2.0-3.0	11.58	14.36	9.72	16.09	13.69	2.87	2.44	9.57	7.69	15.24	15.32	13.31	10.99
3.0-4.0	15.75	18.53	11.13	13.82	12.88	8.03	7.50	12.93	11.30	16.11	14.65	15.03	13.14
4.0-5.0	14.96	18.58	12.10	11.34	12.17	11.74	12.52	15.91	15.65	15.49	11.60	13.89	13.83
5.0-6.0	15.43	11.86	12.61	10.37	9.32	13.84	13.28	15.10	15.16	13.60	7.52	9.34	12.29
6.0-7.0	12.93	8.78	12.90	6.04	5.66	13.87	13.73	11.63	12.41	8.61	5.00	6.74	9.86
7.0-8.0	8.78	5.73	13.62	3.13	2.63	13.08	12.59	8.00	8.89	4.77	3.75	4.23	7.43
8.0-9.0	5.20	3.42	8.87	0.90	1.27	11.99	11.36	5.06	6.23	2.38	2.22	2.44	5.11
9.0-10.0	2.02	0.94	5.24	0.44	0.63	9.56	9.18	2.55	3.84	0.85	1.34	1.84	3.20
10.0-11.0	0.25	0.27	2.08	0.07	0.63	6.41	6.00	1.59	2.78	0.11	0.74	0.76	1.81
11.0-12.0	0.09	0.12	1.08	0.00	0.38	3.94	4.66	1.08	1.27	0.02	0.23	0.58	1.12
12.0-13.0	0.04	0.00	0.25	0.00	0.14	1.88	3.25	0.94	0.44	0.00	0.07	0.34	0.61
13.0-14.0	0.00	0.00	0.02	0.07	0.14	0.93	1.68	0.81	0.12	0.00	0.05	0.00	0.32
14.0-15.0	0.00	0.00	0.04	0.00	0.05	0.37	0.81	0.60	0.05	0.00	0.02	0.00	0.16
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.12	0.36	0.38	0.00	0.00	0.00	0.00	0.07
16.0-17.0	0.00	0.00	0.00	0.02	0.00	0.02	0.11	0.22	0.00	0.00	0.00	0.00	0.03
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.05	0.09	0.13	0.00	0.00	0.00	0.00	0.02
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.07	0.00	0.00	0.00	0.00	0.01
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 78m **Based on Data June 2013 to May 2014**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

TABLE 7C

POOPARA

PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	ANNUAL
0.0-1.0	3.11	6.65	4.30	20.35	21.66	0.72	0.04	7.10	8.47	12.73	22.48	15.34	10.25
1.0-2.0	7.35	10.14	7.19	15.30	15.05	1.00	0.47	6.12	5.86	10.40	15.07	11.11	8.75
2.0-3.0	13.37	15.23	10.22	17.94	15.41	4.31	2.82	9.77	8.26	15.84	16.37	16.22	12.15
3.0-4.0	16.24	19.00	10.60	14.33	14.19	8.24	8.58	13.75	11.99	16.25	14.88	16.38	13.70
4.0-5.0	15.30	18.45	12.21	11.30	12.60	11.78	12.81	16.11	15.63	15.60	10.88	14.27	13.91
5.0-6.0	15.48	11.76	12.01	10.37	9.87	13.80	13.35	15.28	15.25	13.65	7.52	9.77	12.34
6.0-7.0	12.93	8.43	12.48	5.86	5.61	13.96	13.93	11.36	12.06	7.98	5.12	6.81	9.71
7.0-8.0	8.71	6.03	13.75	3.01	2.56	12.96	12.32	8.15	8.68	4.64	3.47	4.28	7.38
8.0-9.0	5.13	3.20	8.92	0.95	1.20	11.83	10.98	4.55	6.23	2.26	2.06	2.53	4.99
9.0-10.0	1.97	0.82	5.00	0.44	0.57	9.47	9.05	2.31	3.68	0.56	1.23	1.70	3.07
10.0-11.0	0.29	0.22	2.04	0.07	0.66	5.81	5.87	1.50	2.57	0.07	0.58	0.83	1.71
11.0-12.0	0.09	0.07	1.03	0.00	0.32	3.40	4.32	1.08	0.81	0.02	0.23	0.52	0.99
12.0-13.0	0.02	0.00	0.20	0.00	0.18	1.53	2.96	0.96	0.42	0.00	0.05	0.25	0.55
13.0-14.0	0.00	0.00	0.02	0.07	0.09	0.79	1.48	0.76	0.05	0.00	0.05	0.00	0.28
14.0-15.0	0.00	0.00	0.04	0.00	0.05	0.25	0.56	0.52	0.05	0.00	0.02	0.00	0.12
15.0-16.0	0.00	0.00	0.00	0.02	0.00	0.07	0.31	0.34	0.00	0.00	0.00	0.00	0.06
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.05	0.09	0.25	0.00	0.00	0.00	0.00	0.03
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.05	0.04	0.07	0.00	0.00	0.00	0.00	0.01
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 80m **Based on Data June 2013 to May 2014**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

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NATIONAL INSTITUTE OF WIND ENERGY
CHENNAI

TABLE 8

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED

Deg/ (m/s)	345-15	15-45	45-75	75-105	105-135	135-165	165-195	195-225	225-255	255-285	285-315	315-345	ANNUAL
0.0-1.0	0.88405	1.01425	0.57566	0.39063	0.27184	0.24443	0.29697	0.4089	0.65561	0.83607	0.65789	0.56652	6.8
1.0-2.0	0.75155	1.55336	0.8909	0.66018	0.44773	0.31296	0.29011	0.41804	0.69901	1.4163	0.66932	0.29925	8.4
2.0-3.0	0.36321	2.50365	1.31807	1.20614	0.77668	0.47286	0.43631	0.46829	1.10106	2.5562	0.92973	0.15762	12.3
3.0-4.0	0.14391	2.23182	1.50539	1.52595	1.38204	0.76069	0.43631	0.45916	1.32264	3.97707	1.30437	0.08452	15.1
4.0-5.0	0.05254	1.39346	1.28381	1.56022	2.01023	0.80866	0.31981	0.17133	1.17873	4.62354	1.40716	0.05026	14.9
5.0-6.0	0.00914	0.64419	1.03253	1.60362	2.36659	0.48428	0.05254	0.01142	1.04395	4.56186	0.81552	0.01827	12.6
6.0-7.0	0.00457	0.40662	0.7744	1.29295	1.89145	0.23986	0	0.00228	0.95715	3.88112	0.44088	0.00685	9.9
7.0-8.0	0	0.30154	0.69216	0.83379	1.27239	0.03883	0	0	0.8909	3.3146	0.14391	0	7.5
8.0-9.0	0.02513	0.20788	0.45459	0.32666	0.60307	0.00685	0	0	0.68074	2.60874	0.09823	0	5.0
9.0-10.0	0.00914	0.13021	0.33352	0.07538	0.16904	0	0	0	0.47515	1.79322	0.02513	0	3.0
10.0-11.0	0.00457	0.10051	0.1599	0.02056	0.03198	0	0	0	0.26727	1.2701	0.01142	0	1.9
11.0-12.0	0.00457	0.05711	0.06396	0.00914	0.00228	0	0	0	0.12336	0.9206	0.00457	0	1.2
12.0-13.0	0	0.01371	0.01827	0	0	0	0	0	0.07538	0.60307	0	0	0.7
13.0-14.0	0	0	0.00914	0.00228	0	0	0	0	0.01599	0.32895	0	0	0.4
14.0-15.0	0	0	0	0	0	0	0	0	0	0.17133	0	0	0.2
15.0-16.0	0	0	0	0	0	0	0	0	0	0.10051	0	0	0.1
16.0-17.0	0	0	0	0	0	0	0	0	0	0.03655	0	0	0.0
17.0-18.0	0	0	0	0	0	0	0	0	0	0.02056	0	0	0.0
18.0-19.0	0	0	0	0	0	0	0	0	0	0.00457	0	0	0.0
19.0-20.0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total	2.3	10.6	9.1	9.5	11.2	3.4	1.8	1.9	9.5	33.0	6.5	1.2	100.0

SENSOR HEIGHT: 50m **Based on Data June 2013 to May 2014**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

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NATIONAL INSTITUTE OF WIND ENERGY
CHENNAI
TABLE 8A

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED

Deg/ (m/s)	345-15	15-45	45-75	75-105	105-135	135-165	165-195	195-225	225-255	255-285	285-315	315-345	ANNUAL
0.0-1.0	0.96171	1.29751	0.98227	0.64419	0.42261	0.31753	0.35864	0.34494	0.71729	1.11933	0.90689	0.69216	8.77
1.0-2.0	0.47971	1.30894	1.02339	0.82008	0.43174	0.29011	0.30154	0.36778	0.50027	1.17644	0.52312	0.17133	7.39
2.0-3.0	0.22158	1.56935	1.50311	1.30208	0.7013	0.37692	0.34494	0.4386	0.76983	2.19755	0.6716	0.08681	10.18
3.0-4.0	0.10051	1.47569	1.57392	1.56707	1.18558	0.64419	0.41804	0.36321	0.91374	3.8994	0.88861	0.0297	13.06
4.0-5.0	0.04569	1.06223	1.44371	1.64702	1.80464	0.48428	0.28098	0.13478	0.83607	5.27458	1.17416	0.02284	14.21
5.0-6.0	0.00685	0.54368	1.23127	1.76352	2.01709	0.06625	0.02513	0.00914	0.64876	5.47332	0.99826	0.00685	12.79
6.0-7.0	0.00228	0.35636	1.0074	1.69499	1.66301	0.02056	0	0.00228	0.5254	4.79943	0.5985	0.00914	10.68
7.0-8.0	0	0.26042	0.91603	1.36605	1.07593	0.00228	0	0	0.40205	4.02047	0.32209	0.00228	8.37
8.0-9.0	0.00228	0.24443	0.71957	0.67389	0.57794	0	0	0	0.16447	3.38542	0.16447	0	5.93
9.0-10.0	0.00914	0.16219	0.5254	0.27184	0.17818	0	0	0	0.04797	2.47853	0.07995	0	3.75
10.0-11.0	0.00228	0.08681	0.23986	0.05711	0.02741	0	0	0	0.01827	1.64474	0.0297	0	2.11
11.0-12.0	0	0.06396	0.14163	0.00685	0	0	0	0	0.00685	1.08507	0.00914	0	1.31
12.0-13.0	0.00228	0.00685	0.05939	0.00228	0	0	0	0	0	0.64647	0.00914	0	0.73
13.0-14.0	0	0	0.00685	0	0	0	0	0	0.00228	0.35408	0	0	0.36
14.0-15.0	0	0	0.00685	0	0	0	0	0	0	0.18503	0	0	0.19
15.0-16.0	0	0	0	0	0	0	0	0	0	0.08681	0	0	0.09
16.0-17.0	0	0	0	0	0	0	0	0	0	0.03655	0	0	0.04
17.0-18.0	0	0	0	0	0	0	0	0	0	0.02741	0	0	0.03
18.0-19.0	0	0	0	0	0	0	0	0	0	0.01142	0	0	0.01
19.0-20.0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Total	1.83	8.44	11.38	11.82	10.09	2.20	1.73	1.66	5.55	37.90	6.38	1.02	100.00

SENSOR HEIGHT: 78m **Based on Data June 2013 to May 2014**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

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NATIONAL INSTITUTE OF WIND ENERGY
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JOINT FREQUENCY DISTRIBUTION OF WIND SPEED

Deg/ (m/s)	345-15	15-45	45-75	75-105	105-135	135-165	165-195	195-225	225-255	255-285	285-315	315-345	ANNUAL
0.0-1.0	0.86349	1.10106	0.85435	0.55281	0.4089	0.30839	0.34265	0.33123	0.69673	1.08507	0.89547	0.64876	8.1
1.0-2.0	0.47743	1.27467	1.0074	0.8612	0.41804	0.28326	0.28554	0.35408	0.5254	1.21071	0.53454	0.21245	7.4
2.0-3.0	0.3061	1.78637	1.68814	1.32264	0.75155	0.41118	0.3792	0.47286	0.79952	2.4831	0.72643	0.08909	11.2
3.0-4.0	0.10508	1.49397	1.66073	1.56022	1.19929	0.66932	0.44088	0.37463	0.93887	4.15296	0.92745	0.03198	13.6
4.0-5.0	0.04569	1.12847	1.48026	1.64017	1.77495	0.45916	0.26499	0.11879	0.83151	5.3591	1.1536	0.02056	14.3
5.0-6.0	0.01827	0.53911	1.23812	1.74068	2.03536	0.05254	0.01599	0.00685	0.65104	5.51215	0.98456	0.00685	12.8
6.0-7.0	0.00228	0.34722	1.00055	1.679	1.63103	0.01827	0	0.00228	0.53226	4.73319	0.57109	0.00914	10.5
7.0-8.0	0	0.24899	0.92745	1.3729	1.0805	0	0	0	0.36321	4.01361	0.31296	0.00228	8.3
8.0-9.0	0.00228	0.233	0.65789	0.72186	0.57337	0	0	0	0.1462	3.30318	0.1462	0	5.8
9.0-10.0	0.00914	0.13478	0.46829	0.28554	0.18275	0	0	0	0.04112	2.39857	0.0731	0	3.6
10.0-11.0	0.00228	0.09594	0.20102	0.07082	0.0297	0	0	0	0.01827	1.53509	0.03198	0	2.0
11.0-12.0	0	0.05026	0.13935	0.00685	0	0	0	0	0.00685	0.95258	0.00914	0	1.2
12.0-13.0	0.00228	0.00457	0.0434	0.00228	0	0	0	0	0	0.58251	0.00914	0	0.6
13.0-14.0	0	0	0.00685	0	0	0	0	0	0.00228	0.30839	0	0	0.3
14.0-15.0	0	0	0.00685	0	0	0	0	0	0	0.13935	0	0	0.1
15.0-16.0	0	0	0	0	0	0	0	0	0	0.0731	0	0	0.1
16.0-17.0	0	0	0	0	0	0	0	0	0	0.03883	0	0	0.0
17.0-18.0	0	0	0	0	0	0	0	0	0	0.01599	0	0	0.0
18.0-19.0	0	0	0	0	0	0	0	0	0	0.00457	0	0	0.0
19.0-20.0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total	1.8	8.4	11.4	11.8	10.1	2.2	1.7	1.7	5.6	37.9	6.4	1.0	100.0

SENSOR HEIGHT: 80m **Based on Data June 2013 to May 2014**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

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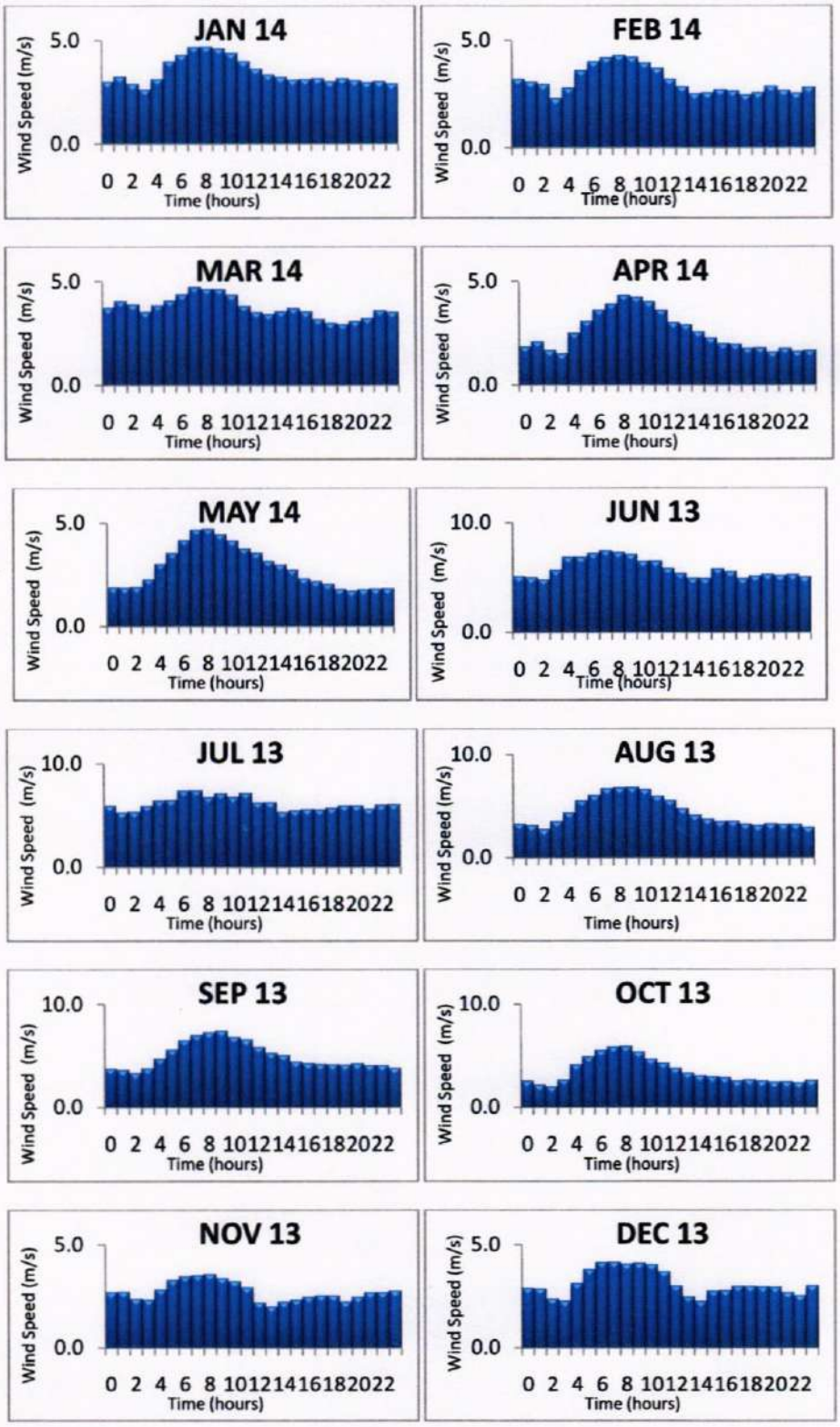

SENSOR HEIGHT: 50m

FIGURE 4: MEAN HOURLY WIND SPEED
(JUNE 2013 TO MAY 2014)

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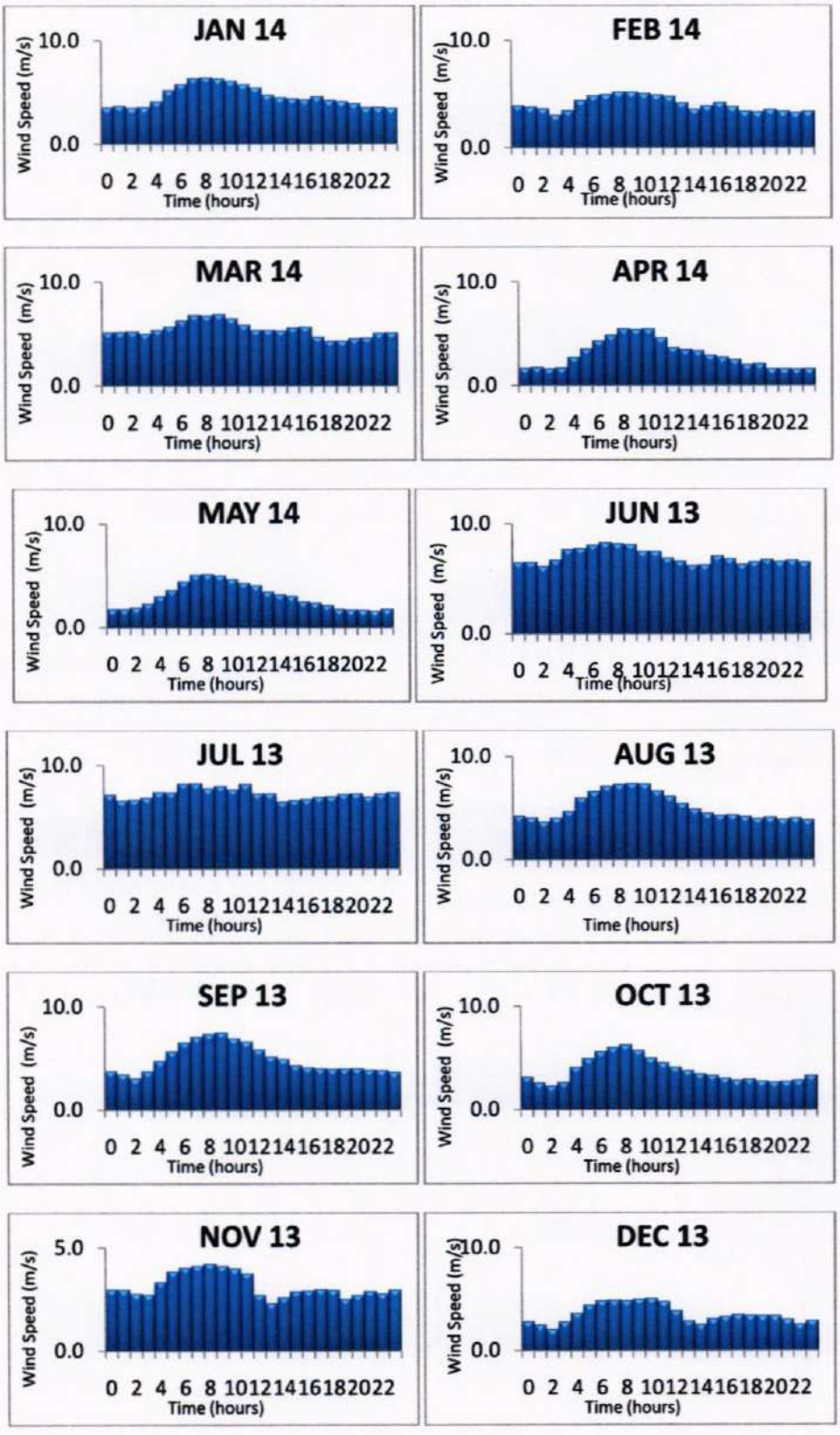

SENSOR HEIGHT: 78m

FIGURE 4A: MEAN HOURLY WIND SPEED
(JUNE 2013 TO MAY 2014)

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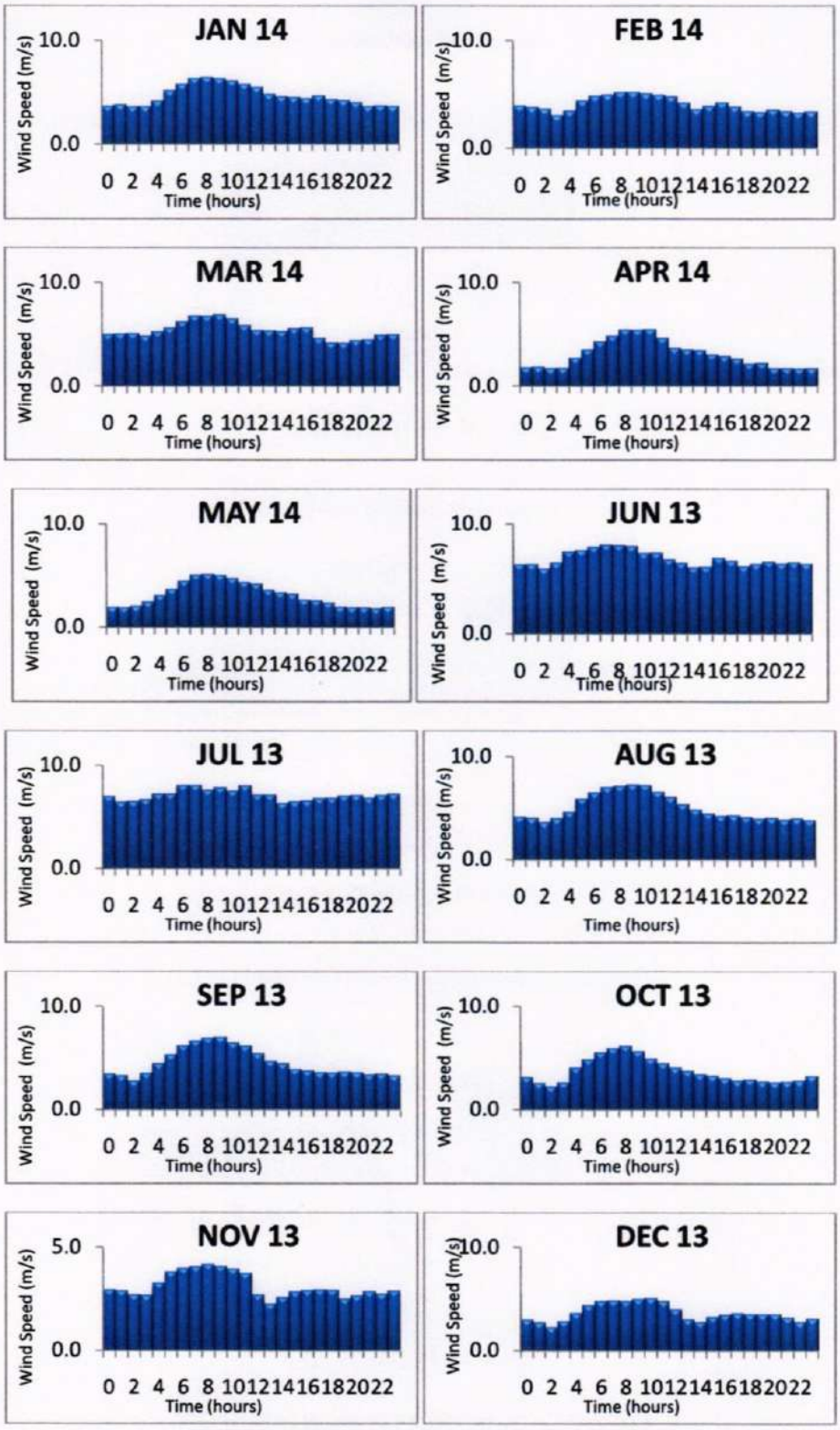
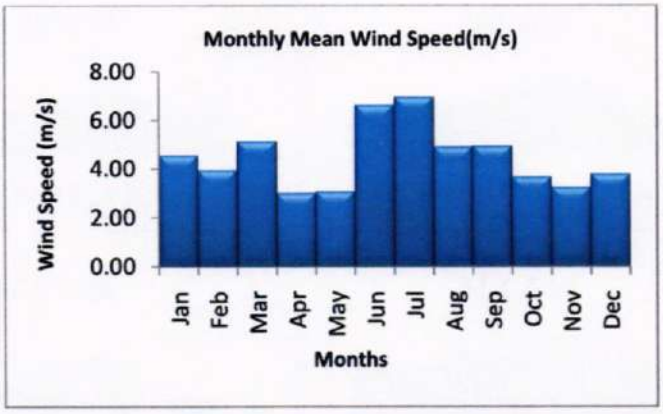
(ISO 9001:2008)

NATIONAL INSTITUTE WIND ENERGY
CHENNAI

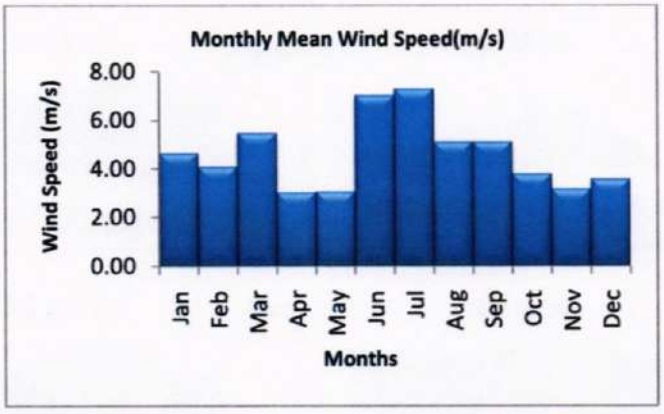


SENSOR HEIGHT: 80m

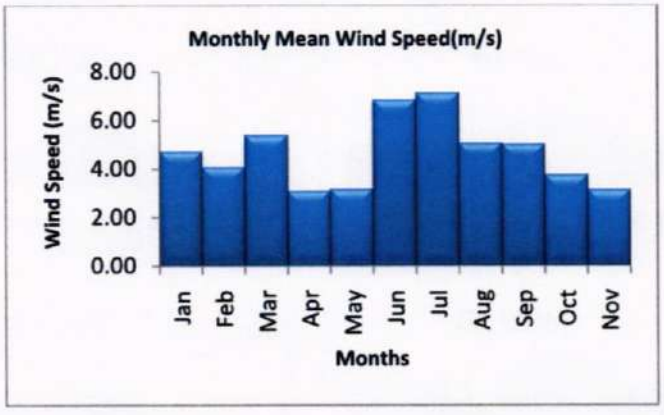
FIGURE 4B: MEAN HOURLY WIND SPEED
(JUNE 2013 TO MAY 2014)



SENSOR HEIGHT: 50m

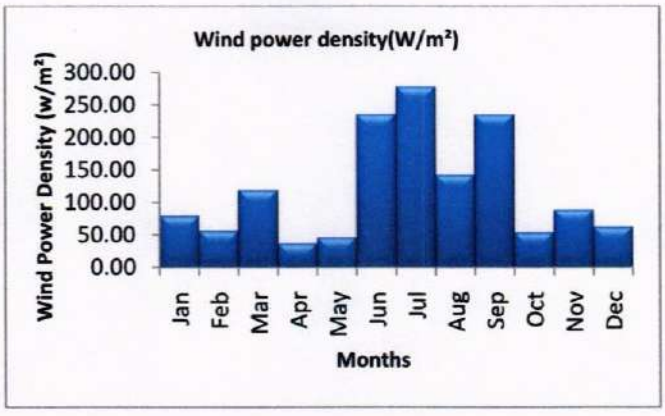


SENSOR HEIGHT: 78 m

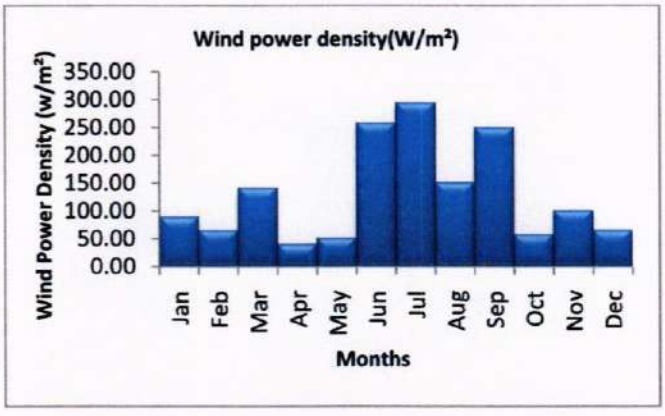


SENSOR HEIGHT: 80m

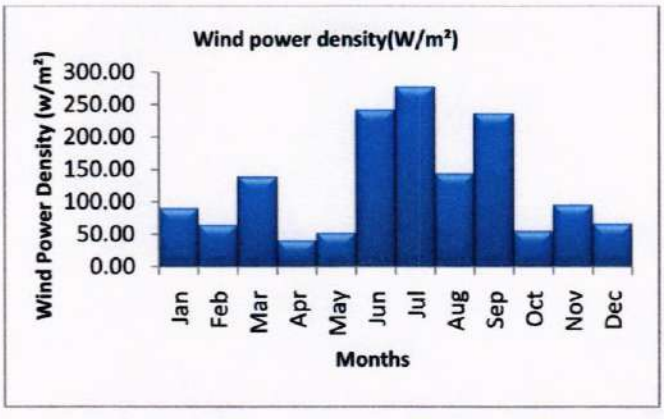
FIGURE 5: MONTHLY MEAN WIND SPEED (JUNE 2013 TO MAY 2014)



SENSOR HEIGHT: 50m



SENSOR HEIGHT: 78m



SENSOR HEIGHT: 80m

FIGURE 6: MONTHLY MEAN WIND POWER DENSITY (JUNE 2013 TO MAY 2014)

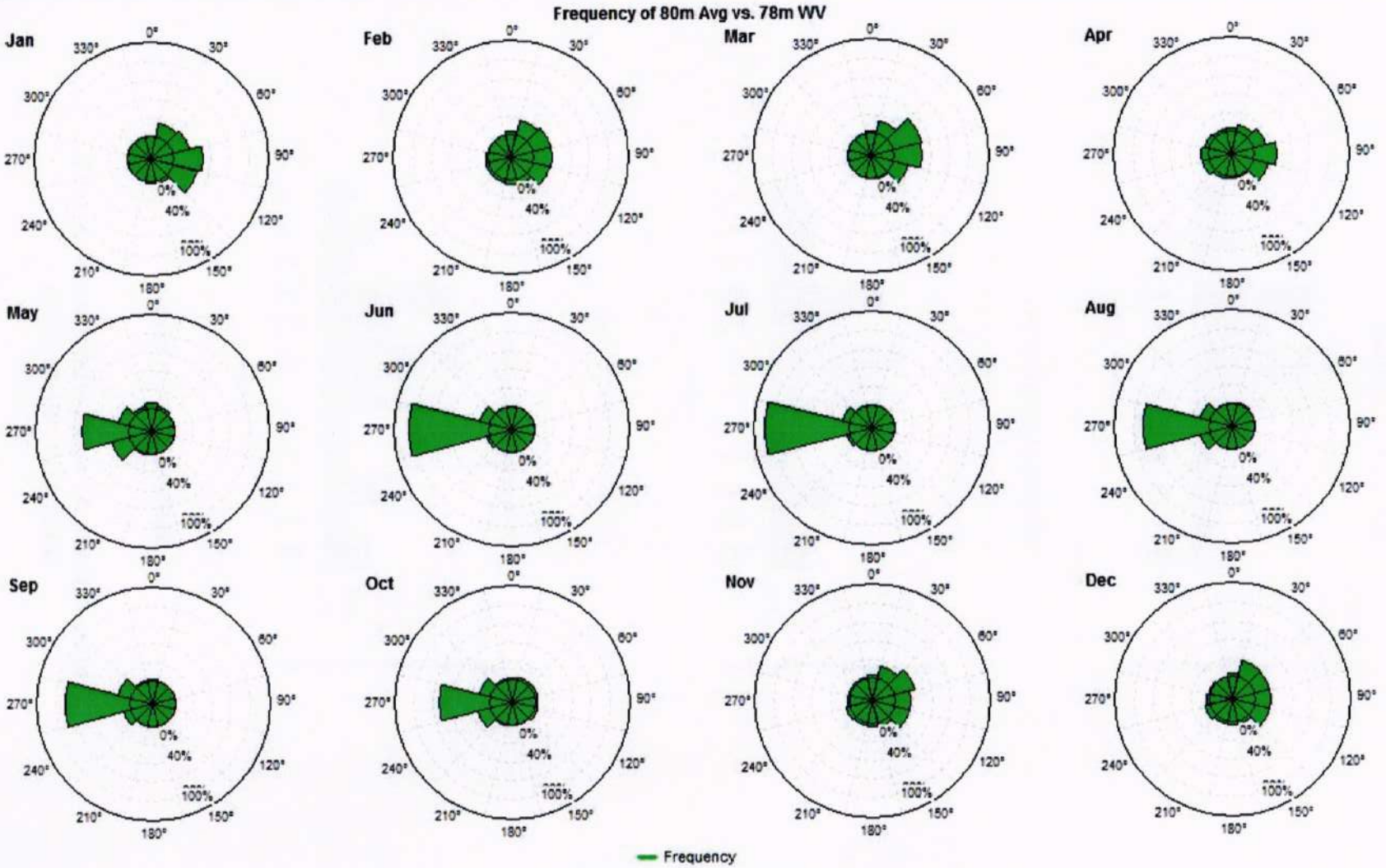


FIGURE 7: WIND ROSE
SENSOR HEIGHT: (80m Anemometer and 78m Wind vane)
(June 2013 to May 2014)

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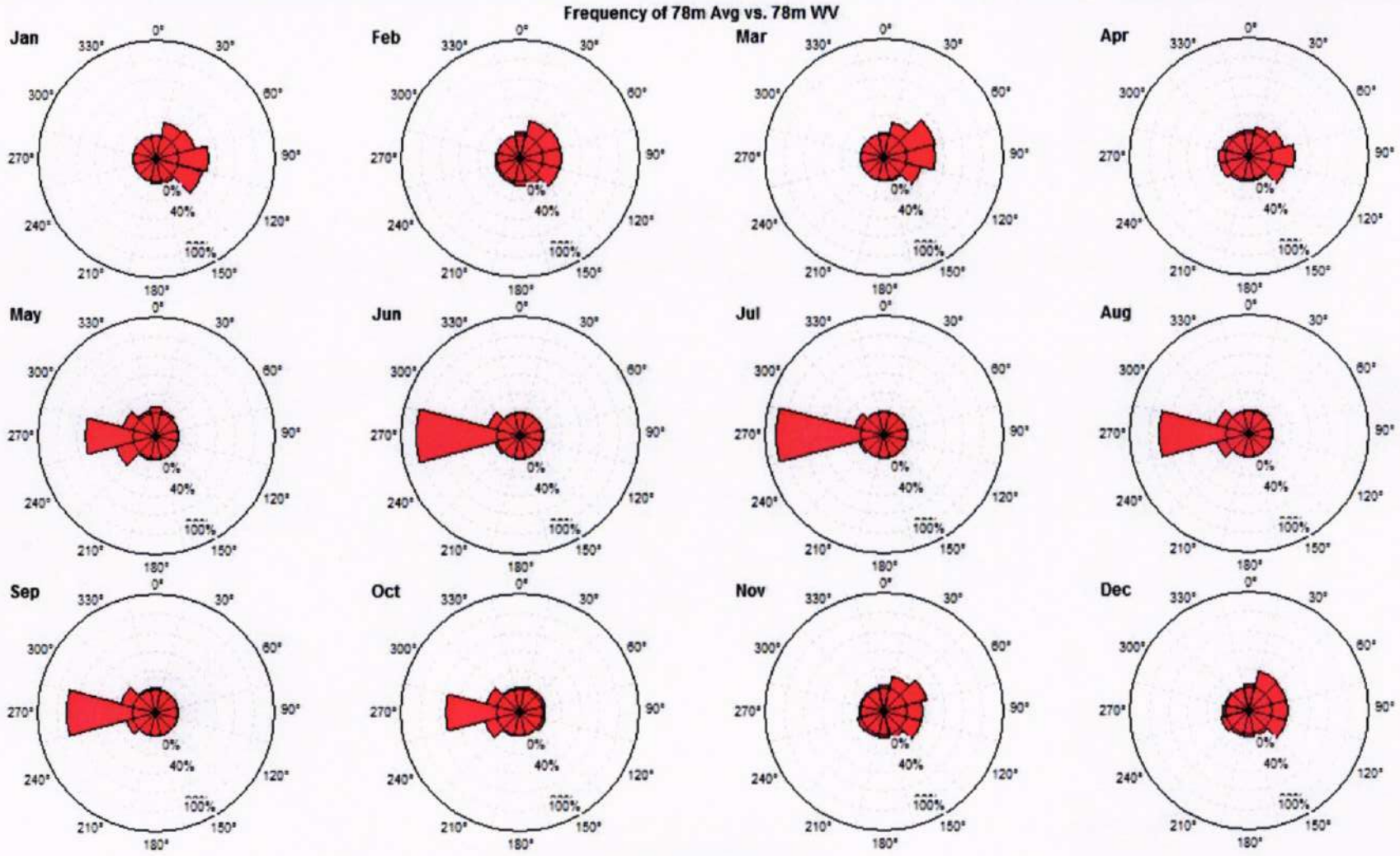


FIGURE 7A: WIND ROSE
SENSOR HEIGHT: (78m Anemometer and 78m Wind vane)
(June 2013 to May 2014)

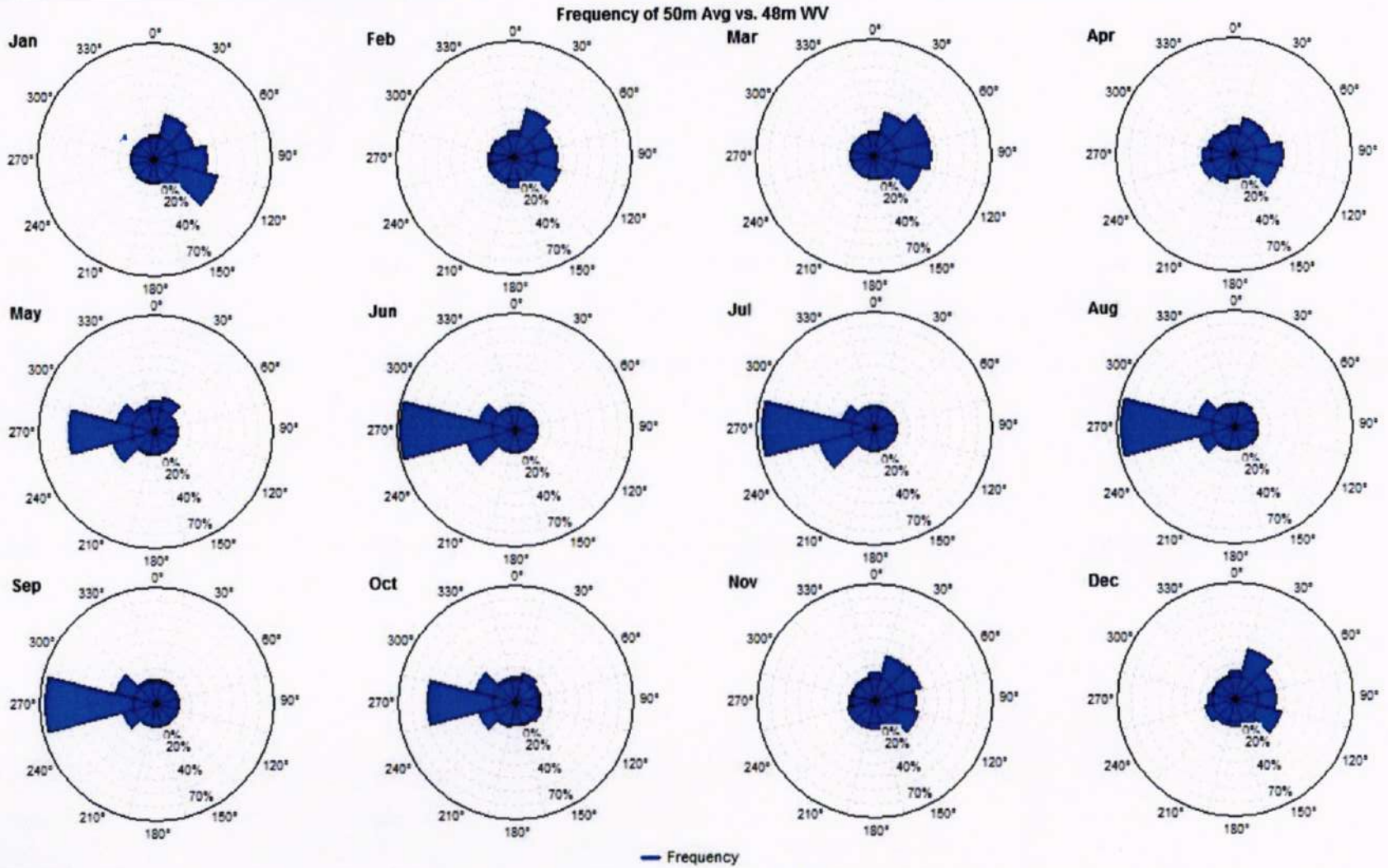


FIGURE 7B: WIND ROSE
SENSOR HEIGHT: (50m Anemometer and 48m Wind vane)
(June 2013 to May 2014)

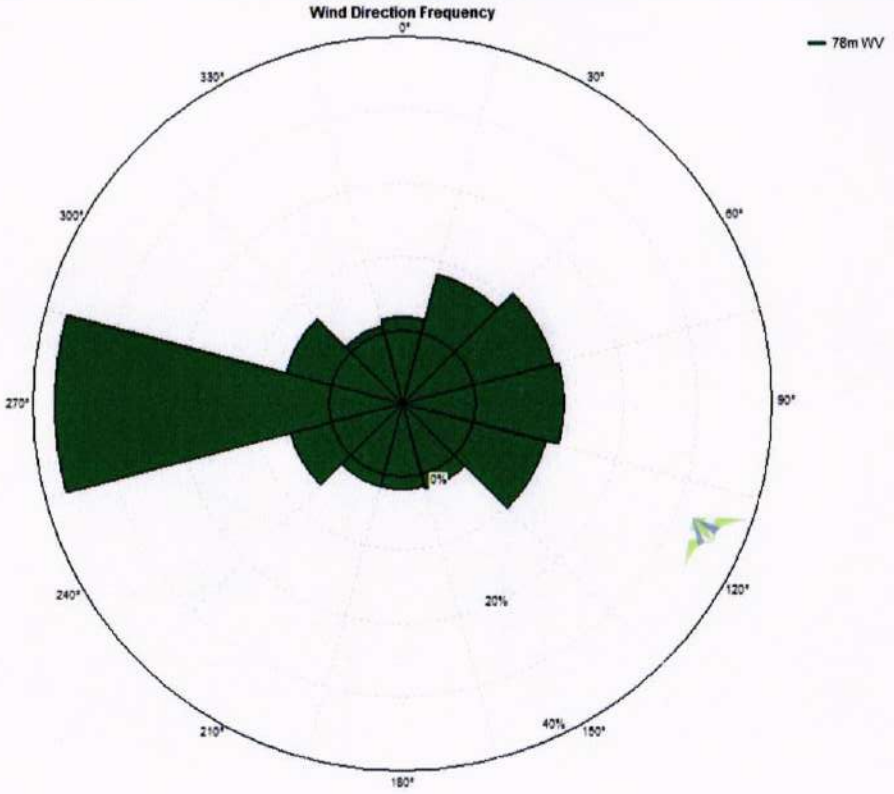
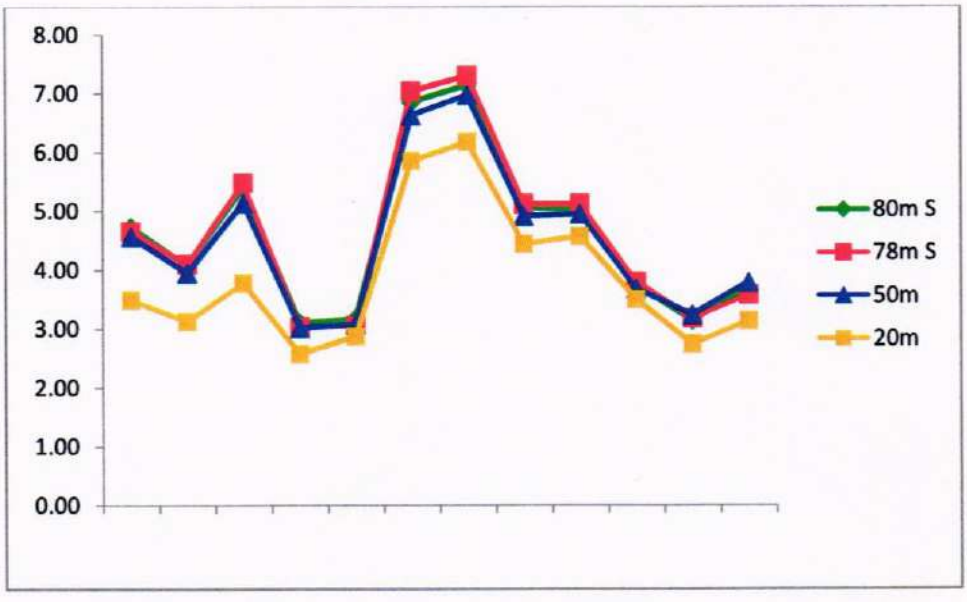
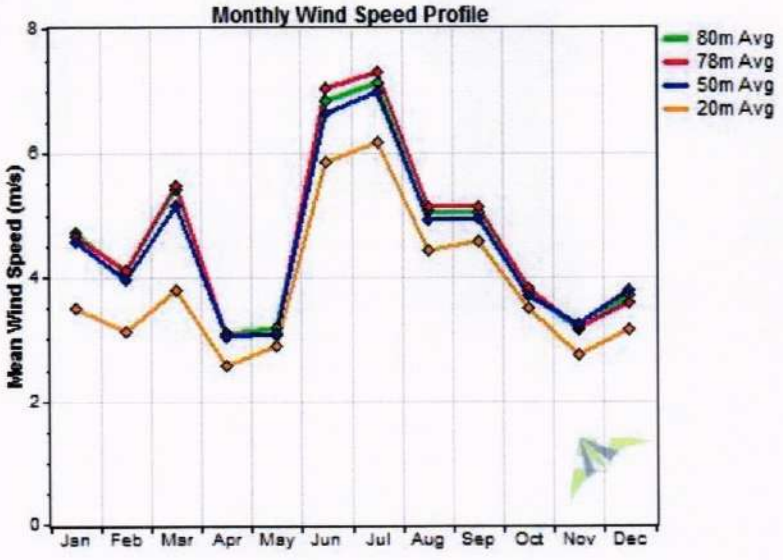


FIGURE 7C: ANNUAL WIND ROSE
SENSOR HEIGHT: (80m Anemometer and 78m Wind vane)
(June 2013 to May 2014)



MONTHLY MEAN WIND SPEED
(JUNE 2013 TO MAY 2014)



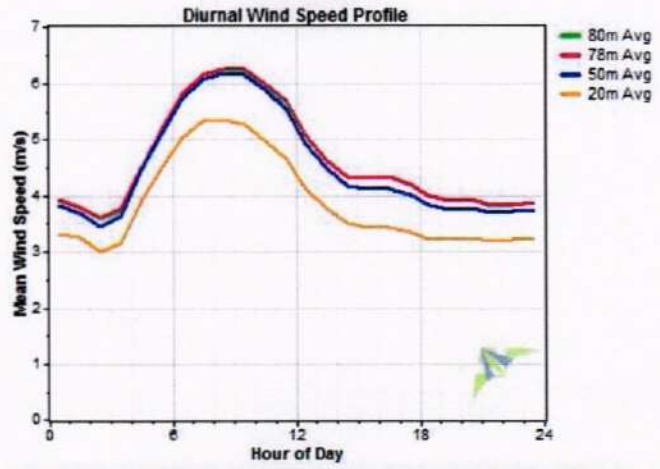


FIGURE 8: MONTHLY WIND SPEED AND DAILY WIND SPEED – POOPARA (JUNE 2013 TO MAY 2014)

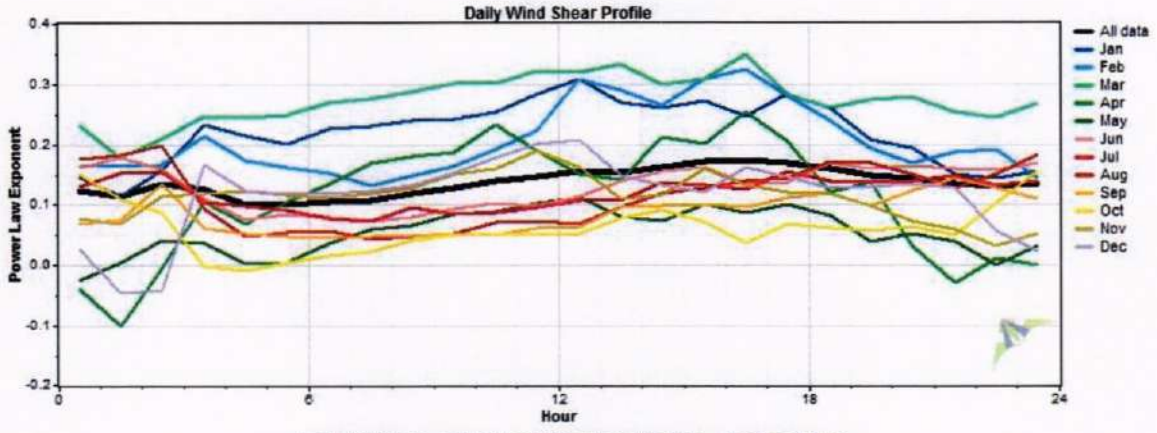


FIGURE 9: DAILY WIND SHEAR- POOPARA (JUNE 2013 TO MAY 2014)

FIGURE 10: MONTHLY WIND SHEAR- POOPARA (JUNE 2013 TO MAY 2014)

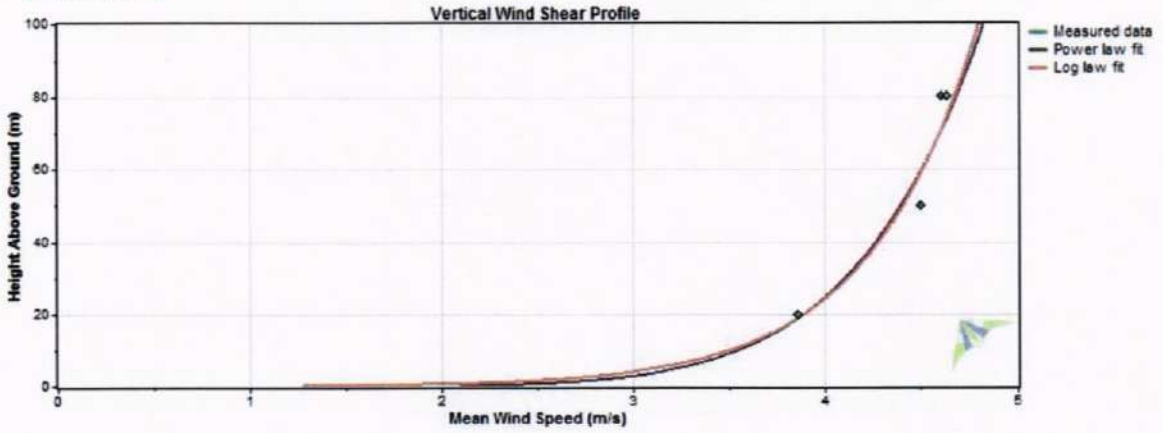
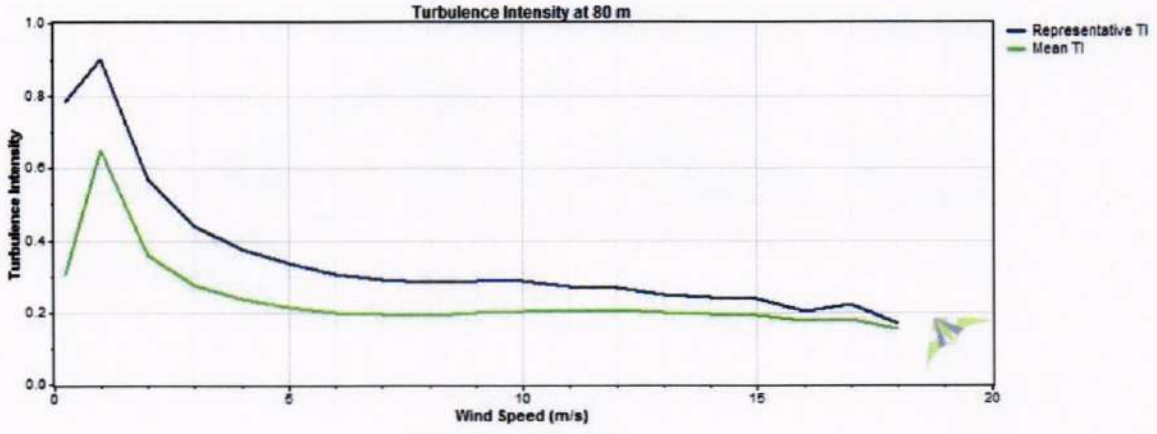
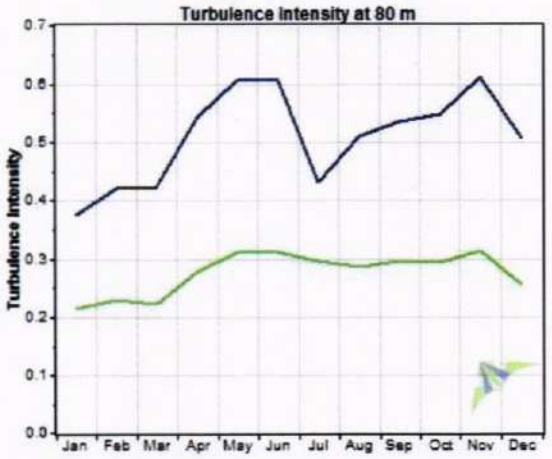
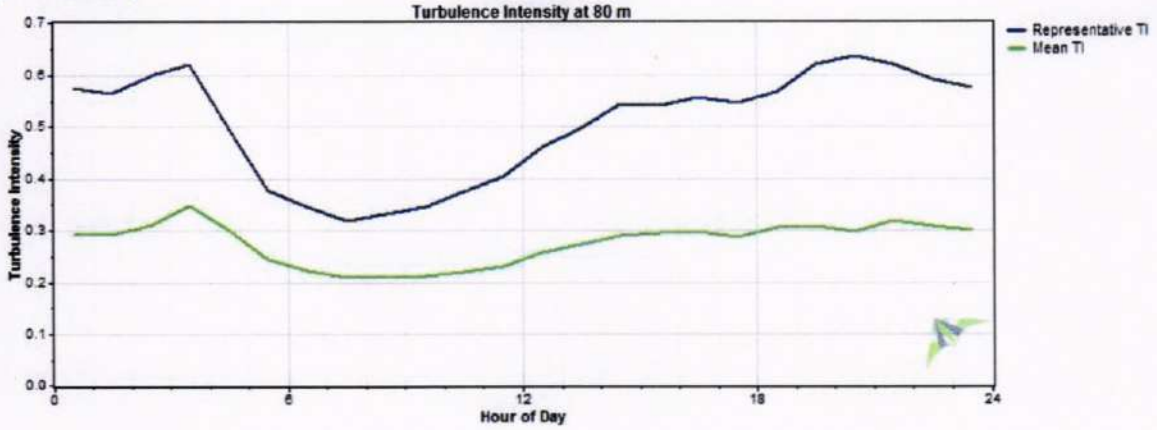


FIGURE 11: VERTICALWIND SHEAR- POOPARA (JUNE 2013 TO MAY 2014)







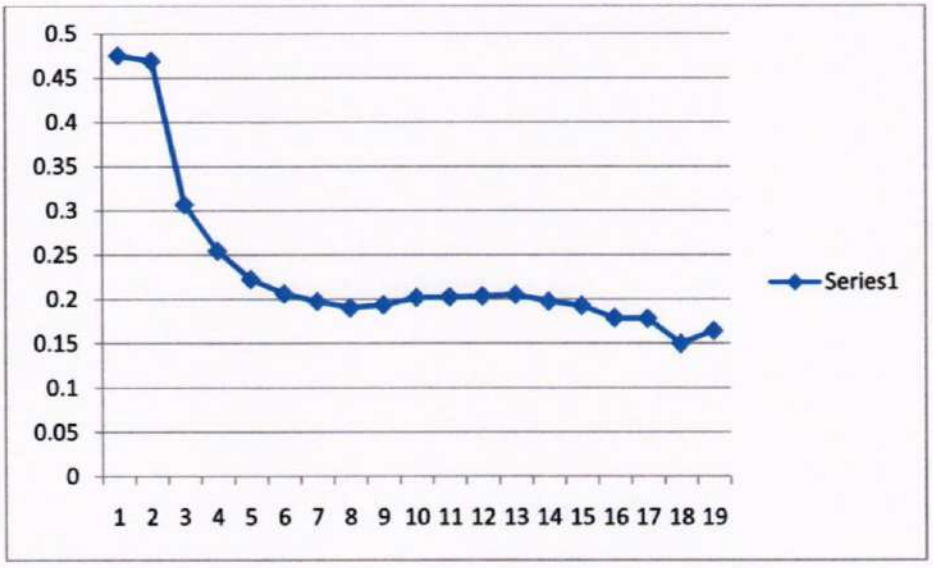


FIGURE 12: TURBULANCE INTENSITY – POOPARA (JUNE 2013 TO MAY 2014)

IInd Year

Jun 2014 - May 2015

POOPARA

TABLE 4
CONSOLIDATED TABLE

	JAN-15	FEB-15	MAR-15	APR-15	MAY-15	JUN-14	JUL-14	AUG-14	SEP-14	OCT-14	NOV-14	DEC-14	ANNUAL
Monthly Mean Wind Speed (m/s)													
20m	3.18	3.31	2.94	2.30	2.72	4.83	6.19	4.47	3.73	2.40	2.95	3.10	3.51
50m	3.98	4.32	3.92	2.59	2.91	5.33	6.99	5.05	4.35	2.89	3.72	3.93	4.17
78 m	3.96	4.47	4.12	2.53	2.90	5.51	7.15	5.14	4.43	2.91	3.81	4.06	4.25
80m	3.95	4.45	4.12	4.31	4.32	5.51	7.12	5.14	4.52	3.03	3.87	4.05	4.53
Monthly Wind Power Density (Watts/Sq.m)													
20m	23.70	29.38	20.24	11.55	27.90	107.27	196.79	102.59	63.12	19.46	31.13	28.55	55.14
50m	51.57	76.70	53.89	21.09	37.21	137.73	261.20	135.49	86.02	34.03	71.74	65.59	86.02
78 m	51.96	87.91	64.2	22.33	39.14	146.44	270.93	141.51	89.99	37.73	83.92	76.64	92.73
80m	51.56	86.62	63.74	42.68	45.86	143.38	262.76	137.73	89.23	38.20	80.88	73.78	93.04
Power Law Index (PLI)													
	0.16	0.21	0.24	0.45	0.33	0.10	0.10	0.10	0.14	0.17	0.20	0.19	0.20
Energy Pattern Factor													
20m	1.42	1.56	1.54	1.81	2.51	1.84	1.59	2.20	2.35	2.72	2.34	1.82	1.98
50m	1.57	1.83	1.72	2.31	2.71	1.76	1.47	2.03	2.02	2.72	2.68	2.08	2.08
78 m	1.61	1.90	1.77	2.64	2.90	1.69	1.43	2.00	2.00	2.96	2.92	2.19	2.17
80m	1.61	1.89	1.76	1.02	1.02	1.65	1.40	1.95	1.86	2.65	2.68	2.14	1.80
Air Density (kg/m^3)													
	1.042	1.039	1.035	1.045	1.110	1.035	1.040	1.040	1.038	1.038	1.039	1.010	1.043
Temperature (^{0} C)													
	18.90	19.78	21.15	--	--	19.72	18.45	18.49	19.25	19.60	19.30	19.16	19.38
Turbulance Intensity (at 80m agl)													
At 15m/s : 0.27													
Data Availability (Based on 10 Minutes Interval)													
	3684	4032	4464	4320	4464	4320	4459	4464	4320	4464	4320	3216	

Based on Data June 2014 to May 2015

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POOPARA

TABLE 5

SUMMARY OF WIND DATA

Monthly Mean wind speed (m/s)			Monthly standard Deviation (m/s)			Peak wind speed(m/s) (date/year/Time of occurance)			Prevailing wind Direction	
(50m)	(80m)	(78m)	(50m)	(80m)	(78m)	(50m)	(80m)	(78m)	(50m)	(80m)
3.98	3.95	3.96	0.79	0.75	0.76	9.22 1/27/2015 15:30	9.16 1/24/2015 14:50	9.10 1/24/2015 14:50	SE	SE
4.32	4.45	4.47	0.86	0.81	0.81	11.06 2/2/2015 22:20	11.30 2/3/2015 7:00	11.53 2/3/2015 7:00	NNE	NE/E
3.92	4.12	4.12	0.81	0.77	0.77	10.38 3/14/2015 21:00	10.45 3/14/2015 21:00	10.69 3/14/2015 21:00	E	E
2.59	4.31	2.53	--	--	--	9.15 4/27/2015 00:50	6.34 4/24/2015 15:40	9.46 4/27/2015 00:50	NNE	NNE
2.91	4.31	2.90	0.69	--	0.70	9.93 5/17/2015 15:10	6.16 5/6/2015 23:10	10.45 5/17/2015 15:10	W	W
5.33	5.51	5.51	1.43	1.47	1.49	14.92 6/18/2014 8:40	14.85 6/19/2014 14:40	15.01 6/19/2014 14:40	W	W
6.99	7.12	7.15	1.88	1.90	1.95	15.99 7/13/2014 4:40	15.98 7/15/2014 15:20	16.11 7/15/2014 15:20	W	W
5.05	5.14	5.14	1.29	1.30	1.33	15.49 8/31/2014 8:20	15.98 8/31/2014 8:20	16.29 8/31/2014 8:20	W	W
4.35	4.52	4.43	1.10	1.10	1.14	13.54 9/1/2014 8:40	13.14 9/1/2014 5:20	13.34 9/1/2014 5:20	W	W
2.89	3.03	2.91	0.70	0.68	0.70	11.22 10/22/2014 00:20	11.65 10/22/2014 00:20	11.87 10/22/2014 00:20	W	W
3.72	3.87	3.81	0.77	0.75	0.76	13.57 11/20/2014 10:20	13.60 11/20/2014 10:40	13.77 11/20/2014 10:40	NE	NE
3.93	4.05	4.06	0.80	0.78	0.79	12.68 12/18/2014 21:00	13.50 12/18/2014 21:00	13.49 12/18/2014 21:00	NNE	NNE
4.17	**4.53**	**4.25**	**1.01**	**1.03**	**1.02**	**15.99 7/13/2014 4:40**	**15.98 7/15/2014 15:20**	**16.29 8/31/2014 8:20**	**W**	**W**

Based on Data June 2014 to May 2015

NATIONAL INSTITUTE OF WIND ENERGY
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TABLE 6

POOPARA

MEAN HOURLY WIND SPEED

MONTH	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	4.47	4.90	5.16	5.36	5.33	5.05	4.74	4.35	3.38	2.89	3.13	3.46	3.78	3.62	3.73	3.51	3.48	3.49	3.27	3.55	3.67	3.43	2.98	3.53	3.93
FEB	3.72	3.94	3.73	3.40	3.66	3.74	3.62	3.56	3.56	4.02	4.83	5.44	5.44	5.55	5.46	5.58	5.67	5.60	4.84	4.11	4.15	4.33	4.69	4.14	4.45
MAR	3.33	3.37	3.31	3.36	3.22	3.38	3.43	3.28	2.72	3.19	3.77	4.41	5.21	5.35	5.59	5.33	5.07	4.77	4.29	4.47	4.78	4.97	4.50	3.82	4.12
APR	4.15	4.12	4.10	4.20	4.32	4.46	4.55	4.65	4.71	4.72	4.66	4.49	4.40	4.40	4.35	4.29	4.28	4.22	4.17	4.13	4.09	4.09	4.10	4.09	4.32
MAY	3.97	3.92	3.94	3.99	4.09	4.09	4.26	4.39	4.52	4.68	4.65	4.63	4.62	4.45	4.42	4.23	4.12	4.14	4.08	4.00	3.92	3.86	3.85	3.87	4.20
JUN	4.91	4.62	4.78	4.75	4.65	4.60	4.48	4.28	4.87	5.49	5.87	6.93	6.93	7.69	7.65	7.35	6.46	6.22	5.57	5.37	4.87	4.41	4.52	5.05	5.51
JUL	6.72	6.56	6.91	7.06	7.04	6.74	6.38	6.42	6.49	6.94	7.26	8.05	8.31	8.74	8.26	7.99	7.84	7.39	7.34	6.63	6.49	6.55	6.42	6.42	7.12
AUG	4.00	4.65	4.50	4.35	4.78	4.69	4.18	4.44	4.31	4.43	5.11	5.62	6.22	6.62	6.82	6.79	6.31	5.81	5.79	5.46	5.00	4.93	4.54	4.11	5.14
SEP	3.57	3.57	3.65	3.58	3.27	3.54	3.46	3.25	3.17	4.17	5.27	6.07	6.69	7.02	6.56	6.31	6.06	5.18	4.48	4.46	4.31	3.87	3.73	3.34	4.52
OCT	2.52	2.41	2.29	2.37	2.27	2.39	2.25	2.40	2.40	2.90	3.70	4.20	4.35	4.56	4.46	3.80	3.55	3.28	3.30	2.84	2.69	2.79	2.58	2.43	3.03
NOV	3.80	3.33	3.32	3.39	3.30	3.51	3.28	3.51	3.52	3.81	4.65	4.61	4.45	4.50	4.29	4.52	4.45	3.81	3.37	4.06	3.77	3.60	4.05	4.08	3.87
DEC	3.79	4.23	4.09	4.29	4.07	4.06	4.36	4.20	4.18	3.75	3.85	4.22	4.41	4.32	4.30	4.37	3.90	3.48	3.49	3.71	4.10	4.29	4.08	3.96	4.06
Annual	4.08	4.14	4.15	4.18	4.17	4.19	4.08	4.06	3.99	4.25	4.73	5.18	5.40	5.57	5.49	5.34	5.10	4.78	4.50	4.40	4.32	4.26	4.17	4.07	4.52

SENSOR HEIGHT: 80m

Based on Data June 2014 to May 2015

NATIONAL INSTITUTE OF WIND ENERGY
CHENNAI

TABLE 6A

POOPARA

MEAN HOURLY WIND SPEED

MONTH	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	4.48	4.90	5.17	5.38	5.35	5.07	4.74	4.34	3.37	2.87	3.13	3.46	3.77	3.62	3.74	3.51	3.49	3.51	3.31	3.59	3.71	3.48	3.01	3.54	3.94
FEB	3.71	3.94	3.77	3.43	3.70	3.78	3.65	3.59	3.61	4.09	4.91	5.50	5.50	5.58	5.48	5.60	5.67	5.57	4.80	4.10	4.13	4.32	4.69	4.14	4.47
MAR	3.32	3.38	3.34	3.40	3.21	3.39	3.43	3.28	2.73	3.22	3.83	4.48	5.27	5.40	5.57	5.32	5.06	4.78	4.27	4.41	4.73	4.90	4.47	3.80	4.12
APR	2.40	2.31	2.19	1.96	1.83	1.61	1.54	1.35	1.62	2.41	3.01	3.68	3.86	3.93	3.78	3.56	3.31	2.85	2.48	2.38	2.28	2.15	2.03	2.14	2.53
MAY	2.14	2.15	1.93	1.91	1.77	1.76	1.70	1.29	1.52	2.15	3.32	4.03	4.47	4.94	4.96	4.67	3.83	3.56	3.39	3.42	2.98	2.77	2.69	2.17	2.90
JUN	4.86	4.57	4.76	4.73	4.62	4.56	4.45	4.25	4.86	5.49	5.87	6.97	6.97	7.75	7.72	7.41	6.50	6.25	5.59	5.40	4.87	4.37	4.48	5.01	5.51
JUL	6.71	6.55	6.92	7.06	7.03	6.73	6.37	6.43	6.52	6.99	7.33	8.13	8.40	8.85	8.35	8.06	7.91	7.44	7.37	6.61	6.49	6.54	6.42	6.41	7.15
AUG	3.99	4.66	4.48	4.33	4.76	4.68	4.16	4.44	4.29	4.40	5.10	5.61	6.24	6.66	6.86	6.83	6.34	5.83	5.80	5.46	4.98	4.92	4.53	4.10	5.14
SEP	3.39	3.39	3.48	3.42	3.14	3.40	3.30	3.09	2.99	4.11	5.26	6.10	6.73	7.08	6.59	6.33	6.08	5.15	4.40	4.36	4.19	3.67	3.53	3.13	4.43
OCT	2.44	2.29	2.15	2.24	2.12	2.26	2.09	2.24	2.21	2.74	3.58	4.11	4.29	4.50	4.43	3.73	3.50	3.18	3.18	2.66	2.49	2.66	2.41	2.30	2.91
NOV	3.70	3.26	3.25	3.30	3.20	3.42	3.15	3.42	3.44	3.82	4.70	4.63	4.46	4.49	4.25	4.51	4.42	3.72	3.24	3.95	3.65	3.50	4.00	4.01	3.81
DEC	3.77	4.19	4.05	4.29	4.09	4.09	4.39	4.23	4.22	3.77	3.87	4.27	4.48	4.37	4.33	4.42	3.93	3.50	3.47	3.71	4.10	4.32	4.10	3.96	4.08
Annual	3.74	3.80	3.79	3.79	3.73	3.73	3.58	3.50	3.45	3.84	4.49	5.08	5.37	5.60	5.51	5.33	5.00	4.61	4.27	4.17	4.05	3.97	3.86	3.73	4.25

SENSOR HEIGHT: 78m

Based on Data June 2014 to May 2015

NATIONAL INSTITUTE OF WIND ENERGY
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TABLE 6B

POOPARA

MEAN HOURLY WIND SPEED

MONTH	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	4.57	5.00	5.22	5.43	5.42	5.07	4.75	4.23	3.35	2.85	3.15	3.45	3.80	3.67	3.72	3.53	3.51	3.51	3.42	3.65	3.76	3.55	3.08	3.57	3.97
FEB	3.62	3.82	3.55	3.33	3.59	3.80	3.61	3.42	3.46	3.92	4.78	5.36	5.35	5.45	5.38	5.53	5.61	5.37	4.50	3.82	3.92	4.07	4.41	4.00	4.32
MAR	3.15	3.26	3.21	3.25	3.16	3.20	3.26	3.14	2.55	3.17	3.73	4.22	4.98	5.15	5.38	5.13	4.81	4.52	4.11	4.18	4.39	4.56	4.09	3.54	3.92
APR	2.43	2.36	2.23	2.09	1.97	1.95	1.85	1.49	1.68	2.44	3.07	3.71	3.87	3.92	3.72	3.49	3.27	2.86	2.49	2.33	2.37	2.21	2.10	2.15	2.59
MAY	2.15	2.20	1.97	1.97	1.77	1.84	1.80	1.33	1.48	2.18	3.38	4.13	4.51	4.97	5.00	4.64	3.82	3.56	3.40	3.40	2.99	2.73	2.61	2.09	2.91
JUN	4.53	4.26	4.47	4.43	4.35	4.23	4.10	4.00	4.74	5.46	5.91	6.94	6.92	7.69	7.66	7.36	6.42	6.12	5.44	5.17	4.64	4.11	4.19	4.76	5.33
JUL	6.42	6.21	6.62	6.85	6.79	6.48	6.09	6.25	6.45	6.90	7.29	8.10	8.44	8.82	8.33	8.02	7.81	7.40	7.24	6.38	6.30	6.31	6.16	6.13	6.99
AUG	3.78	4.55	4.32	4.24	4.70	4.55	3.96	4.30	4.24	4.37	5.13	5.67	6.27	6.64	6.80	6.66	6.25	5.73	5.72	5.33	4.84	4.78	4.34	3.92	5.05
SEP	3.21	3.32	3.42	3.27	2.95	3.25	3.17	2.91	2.93	4.16	5.30	6.09	6.78	7.05	6.52	6.27	6.00	5.08	4.31	4.28	4.06	3.59	3.43	3.03	4.35
OCT	2.32	2.25	2.12	2.25	2.09	2.23	2.12	2.16	2.20	2.72	3.62	4.14	4.29	4.46	4.41	3.71	3.47	3.13	3.12	2.63	2.52	2.56	2.40	2.36	2.89
NOV	3.66	3.26	3.24	3.27	3.15	3.37	3.19	3.39	3.33	3.70	4.51	4.43	4.27	4.35	4.16	4.45	4.31	3.67	3.18	3.84	3.50	3.38	3.87	3.88	3.72
DEC	3.73	4.18	3.96	4.09	3.89	3.90	4.21	4.06	4.01	3.66	3.84	4.18	4.29	4.31	4.13	4.23	3.76	3.41	3.27	3.59	3.91	4.20	3.99	3.86	3.94
Annual	3.63	3.72	3.69	3.70	3.65	3.66	3.51	3.39	3.37	3.80	4.47	5.03	5.32	5.54	5.43	5.25	4.92	4.53	4.18	4.05	3.93	3.84	3.72	3.61	4.16

SENSOR HEIGHT : 50m

Based on Data June 2014 to May 2015

NATIONAL INSTITUTE OF WIND ENERGY
CHENNAI

TABLE 6C

POOPARA

MEAN HOURLY WIND SPEED

MONTH	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE
JAN	3.58	3.95	4.17	4.34	4.35	3.92	3.52	2.96	2.49	2.41	2.56	2.76	3.09	3.06	3.08	2.95	2.87	2.83	2.90	3.09	3.10	2.98	2.50	2.77	3.18
FEB	2.84	2.99	2.85	2.79	3.00	3.14	3.05	2.83	2.67	2.91	3.70	4.09	4.12	4.23	4.11	4.08	4.08	3.72	3.16	2.88	2.91	2.99	3.24	3.03	3.31
MAR	2.42	2.65	2.61	2.64	2.66	2.62	2.69	2.66	2.02	2.50	2.87	3.21	3.65	3.72	3.77	3.55	3.33	3.19	2.98	2.97	3.12	3.20	2.94	2.65	2.94
APR	2.22	2.23	2.04	2.07	2.02	2.03	1.99	1.53	1.55	2.18	2.71	3.22	3.22	3.13	2.86	2.79	2.73	2.46	2.14	2.00	2.04	1.96	1.91	1.89	2.29
MAY	2.06	2.14	1.86	1.96	1.72	1.86	1.78	1.50	1.47	2.06	3.10	3.81	4.18	4.55	4.57	4.21	3.50	3.30	3.15	3.05	2.68	2.42	2.32	1.91	2.72
JUN	4.00	3.72	3.98	3.97	3.87	3.73	3.62	3.63	4.32	5.03	5.49	6.46	6.42	7.20	7.15	6.85	5.89	5.56	4.88	4.61	4.11	3.61	3.66	4.23	4.83
JUL	5.60	5.34	5.76	5.98	5.93	5.67	5.23	5.48	5.73	6.12	6.57	7.37	7.76	8.10	7.57	7.25	6.99	6.64	6.39	5.56	5.51	5.53	5.29	5.30	6.20
AUG	3.18	4.03	3.80	3.71	4.15	4.00	3.41	3.72	3.68	3.89	4.62	5.17	5.73	6.06	6.23	5.96	5.62	5.15	5.09	4.67	4.24	4.16	3.72	3.37	4.47
SEP	2.60	2.70	2.82	2.62	2.42	2.62	2.58	2.29	2.39	3.70	4.78	5.52	6.14	6.34	5.76	5.54	5.29	4.44	3.77	3.69	3.36	2.90	2.73	2.47	3.73
OCT	1.91	1.87	1.77	1.88	1.70	1.83	1.72	1.62	1.77	2.34	3.09	3.61	3.73	3.78	3.70	3.12	2.88	2.61	2.61	2.14	2.08	1.98	1.88	1.96	2.40
NOV	2.92	2.70	2.62	2.53	2.50	2.63	2.60	2.77	2.61	2.88	3.49	3.52	3.40	3.46	3.35	3.67	3.45	2.95	2.54	2.89	2.69	2.65	2.93	2.99	2.95
DEC	3.02	3.28	3.08	3.16	3.06	3.11	3.29	3.27	3.08	2.85	3.09	3.36	3.41	3.46	3.27	3.27	2.96	2.72	2.52	2.82	2.94	3.30	3.21	3.15	3.11
Annual	3.03	3.13	3.11	3.14	3.12	3.10	2.96	2.85	2.81	3.24	3.84	4.34	4.57	4.76	4.62	4.44	4.13	3.80	3.51	3.37	3.23	3.14	3.03	2.98	3.51

SENSOR HEIGHT : 20m

Based on Data June 2014 to May 2015

POOPARA

TABLE 7

PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	ANNUAL
0.0-1.0	2.96	4.89	6.61	14.14	15.27	3.29	0.38	12.95	11.76	24.80	16.32	7.06	10.03
1.0-2.0	13.68	13.96	15.01	27.25	21.72	8.38	2.69	8.51	14.28	20.54	17.59	15.39	14.92
2.0-3.0	27.52	23.83	30.29	32.05	19.76	13.68	8.05	11.02	18.26	21.82	20.81	27.05	21.18
3.0-4.0	30.59	24.93	30.06	18.38	16.53	15.95	11.53	12.86	15.65	17.52	19.68	26.71	20.03
4.0-5.0	18.76	20.96	13.26	6.30	16.01	15.30	14.51	13.44	12.71	8.15	13.24	14.02	13.89
5.0-6.0	5.86	8.28	3.45	1.55	5.28	13.06	13.95	12.21	8.70	3.74	5.51	5.81	7.28
6.0-7.0	0.62	2.41	1.10	0.28	3.59	10.53	12.78	10.35	7.71	1.97	3.54	2.08	4.75
7.0-8.0	0.00	0.60	0.22	0.05	1.64	8.70	11.24	7.37	5.60	1.08	2.18	0.68	3.28
8.0-9.0	0.00	0.15	0.00	0.00	0.18	5.14	8.90	5.49	3.10	0.29	0.69	0.62	2.05
9.0-10.0	0.00	0.00	0.00	0.00	0.02	3.13	6.71	3.00	1.48	0.09	0.37	0.50	1.27
10.0-11.0	0.00	0.00	0.00	0.00	0.00	1.64	4.15	1.72	0.35	0.00	0.07	0.06	0.67
11.0-12.0	0.00	0.00	0.00	0.00	0.00	0.86	2.94	0.65	0.23	0.00	0.00	0.00	0.39
12.0-13.0	0.00	0.00	0.00	0.00	0.00	0.14	1.21	0.16	0.12	0.00	0.00	0.00	0.14
13.0-14.0	0.00	0.00	0.00	0.00	0.00	0.16	0.65	0.18	0.05	0.00	0.00	0.00	0.09
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.05	0.25	0.09	0.00	0.00	0.00	0.00	0.03
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.01
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 20m **Based on Data June 2014 to May 2015**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

POOPARA

TABLE 7A
PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	ANNUAL
0.0-1.0	2.28	5.48	6.72	18.75	20.26	3.47	0.18	11.18	8.68	22.65	16.02	6.72	10.20
1.0-2.0	9.50	9.57	9.97	20.49	19.49	6.53	1.03	6.68	9.49	15.95	14.17	10.70	11.13
2.0-3.0	19.54	16.29	15.46	23.78	18.19	10.25	3.99	7.84	13.24	17.54	14.58	18.84	14.96
3.0-4.0	21.61	15.82	20.72	18.26	14.22	12.29	7.94	10.71	16.76	15.84	14.93	21.24	15.86
4.0-5.0	19.79	15.80	18.26	10.45	10.73	15.12	12.51	12.72	14.49	12.19	11.69	16.85	14.22
5.0-6.0	14.06	13.52	14.22	5.24	7.68	14.84	13.48	13.64	11.67	7.68	9.17	9.89	11.26
6.0-7.0	8.28	10.32	8.62	2.09	5.19	11.53	14.42	11.81	10.07	4.17	6.88	6.16	8.29
7.0-8.0	3.91	7.02	4.03	0.72	3.26	9.86	12.54	9.25	7.71	2.55	4.98	4.76	5.88
8.0-9.0	0.90	3.97	1.81	0.19	0.83	6.94	10.90	6.88	4.24	0.94	3.43	1.99	3.58
9.0-10.0	0.14	1.59	0.16	0.05	0.16	4.49	7.98	4.48	2.34	0.36	2.62	1.24	2.13
10.0-11.0	0.00	0.60	0.02	0.00	0.00	2.59	6.48	2.71	0.81	0.11	1.00	0.75	1.26
11.0-12.0	0.00	0.02	0.00	0.00	0.00	1.32	4.04	1.34	0.25	0.02	0.35	0.59	0.66
12.0-13.0	0.00	0.00	0.00	0.00	0.00	0.46	2.65	0.36	0.16	0.00	0.16	0.28	0.34
13.0-14.0	0.00	0.00	0.00	0.00	0.00	0.16	1.10	0.27	0.09	0.00	0.05	0.00	0.14
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.14	0.61	0.09	0.00	0.00	0.00	0.00	0.07
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.04	0.00	0.00	0.00	0.00	0.02
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 50m **Based on Data June 2014 to May 2015**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

NATIONAL INSTITUTE OF WIND ENERGY
CHENNAI

POOPARA

TABLE 7B

PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	ANNUAL
0.0-1.0	3.23	6.15	7.28	23.89	24.70	4.49	0.16	11.58	10.37	25.40	20.19	7.00	12.04
1.0-2.0	10.31	9.77	9.36	18.22	16.91	5.49	0.78	6.00	7.59	15.39	12.52	12.06	10.37
2.0-3.0	18.19	15.00	13.96	21.78	15.85	7.87	3.36	7.21	11.76	15.03	12.80	17.16	13.33
3.0-4.0	20.96	14.78	18.68	16.29	13.00	10.21	6.93	9.57	15.39	13.98	12.50	18.97	14.27
4.0-5.0	20.06	14.36	16.62	10.34	10.94	13.94	10.85	12.43	15.63	11.92	10.14	15.36	13.55
5.0-6.0	14.14	12.90	14.00	5.35	8.06	16.44	13.61	13.84	11.71	8.15	8.91	11.72	11.57
6.0-7.0	7.57	10.71	11.25	2.83	5.68	13.61	14.96	12.77	11.02	5.20	7.66	5.81	9.09
7.0-8.0	4.34	8.01	5.89	0.88	3.71	10.53	14.17	9.77	8.22	3.23	5.37	4.70	6.57
8.0-9.0	1.11	5.03	2.31	0.37	0.94	7.89	11.19	7.30	4.47	1.08	4.47	3.02	4.10
9.0-10.0	0.08	1.93	0.63	0.05	0.16	4.72	8.75	4.59	2.55	0.49	2.87	1.83	2.39
10.0-11.0	0.00	1.02	0.02	0.00	0.04	2.89	6.57	2.60	0.74	0.04	1.62	1.21	1.40
11.0-12.0	0.00	0.32	0.00	0.00	0.00	1.16	4.37	1.41	0.30	0.09	0.58	0.62	0.74
12.0-13.0	0.00	0.00	0.00	0.00	0.00	0.44	2.33	0.45	0.16	0.00	0.30	0.44	0.34
13.0-14.0	0.00	0.00	0.00	0.00	0.00	0.19	1.12	0.34	0.09	0.00	0.07	0.09	0.16
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.12	0.58	0.04	0.00	0.00	0.00	0.00	0.06
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.02	0.20	0.07	0.00	0.00	0.00	0.00	0.02
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.01
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 78m **Based on Data June 2014 to May 2015**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

POOPARA

TABLE 7C
PERCENTAGE FREQUENCY DISTRIBUTION OF WIND SPEED

CLASS INTERVAL (m/s)	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	ANNUAL
0.0-1.0	3.23	5.88	7.28	0.00	2.78	3.45	0.11	11.00	7.87	21.53	16.11	6.28	7.13
1.0-2.0	10.26	10.04	9.36	0.00	1.55	5.30	0.65	5.82	7.82	14.94	13.66	11.75	7.60
2.0-3.0	18.62	15.55	13.96	0.00	1.82	8.45	2.74	6.81	11.04	17.18	14.31	18.22	10.72
3.0-4.0	21.25	14.68	18.68	21.90	21.49	10.90	6.95	10.13	16.55	14.92	13.52	19.37	15.86
4.0-5.0	19.98	14.58	16.62	75.06	65.03	13.96	10.90	12.88	16.78	12.95	10.74	15.52	23.75
5.0-6.0	13.63	12.70	14.00	2.99	5.50	16.67	14.20	14.25	12.64	8.42	9.19	11.44	11.30
6.0-7.0	7.46	10.34	11.25	0.05	1.21	13.77	15.77	12.99	11.57	5.26	7.87	5.91	8.62
7.0-8.0	4.37	7.99	5.89	0.00	0.49	10.58	14.33	9.99	7.82	3.32	5.60	4.98	6.28
8.0-9.0	1.09	5.01	2.31	0.00	0.11	7.73	11.64	7.08	4.68	0.87	4.10	2.67	3.94
9.0-10.0	0.11	2.13	0.63	0.00	0.00	4.81	8.37	4.35	2.15	0.47	2.78	1.80	2.30
10.0-11.0	0.00	0.94	0.02	0.00	0.00	2.71	6.46	2.76	0.60	0.04	1.30	1.00	1.32
11.0-12.0	0.00	0.15	0.00	0.00	0.00	1.04	4.31	1.12	0.28	0.09	0.49	0.65	0.68
12.0-13.0	0.00	0.00	0.00	0.00	0.00	0.32	1.88	0.40	0.14	0.00	0.28	0.37	0.28
13.0-14.0	0.00	0.00	0.00	0.00	0.00	0.21	1.03	0.31	0.05	0.00	0.07	0.03	0.14
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.09	0.45	0.07	0.00	0.00	0.00	0.00	0.05
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.04	0.00	0.00	0.00	0.00	0.02
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0-21.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SENSOR HEIGHT: 80m **Based on Data June 2014 to May 2015**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

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TABLE 8

POOPARA

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED

Deg/ (m/s)	345-15	15-45	45-75	75-105	105-135	135-165	165-195	195-225	225-255	255-285	285-315	315-345	ANNUAL
1.0-2.0	0.79	1.57	1.06	0.76	0.47	0.32	0.35	0.53	0.92	1.39	0.70	0.38	9.23
2.0-3.0	0.50	2.74	1.48	1.13	0.87	0.56	0.40	0.61	1.26	2.37	1.10	0.23	13.25
3.0-4.0	0.18	2.24	1.36	1.49	1.54	0.83	0.42	0.47	1.24	3.64	1.38	0.11	14.90
4.0-5.0	0.06	1.35	1.05	1.09	2.20	1.07	0.17	0.13	1.04	4.75	1.43	0.03	14.38
5.0-6.0	0.02	0.71	0.88	0.78	2.12	0.74	0.02	0.02	0.83	4.96	0.90	0.02	12.00
6.0-7.0	0.01	0.46	0.70	0.51	1.62	0.26	0.00	0.00	0.64	4.73	0.46	0.00	9.40
7.0-8.0	0.00	0.43	0.61	0.36	0.84	0.09	0.00	0.00	0.45	4.15	0.13	0.00	7.08
8.0-9.0	0.00	0.26	0.45	0.13	0.32	0.00	0.00	0.00	0.20	3.23	0.02	0.00	4.62
9.0-10.0	0.00	0.17	0.38	0.02	0.05	0.00	0.00	0.00	0.09	2.20	0.00	0.00	2.92
10.0-11.0	0.00	0.08	0.17	0.00	0.00	0.00	0.00	0.00	0.03	1.47	0.00	0.00	1.75
11.0-12.0	0.00	0.02	0.08	0.00	0.00	0.00	0.00	0.00	0.01	0.82	0.00	0.00	0.92
12.0-13.0	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.43	0.00	0.00	0.47
13.0-14.0	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.20
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.57	10.04	8.26	6.29	10.04	3.89	1.35	1.76	6.73	34.44	6.12	0.79	91.3

SENSOR HEIGHT: 50m **Based on Data June 2014 to May 2015**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

NATIONAL INSTITUTE OF WIND ENERGY
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TABLE 8A

POOPARA

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED

Deg/ (m/s)	345-15	15-45	45-75	75-105	105-135	135-165	165-195	195-225	225-255	255-285	285-315	315-345	ANNUAL
0.0-1.0	1.01	1.27	0.82	0.54	0.48	0.38	0.49	0.52	1.08	1.51	1.17	0.84	10.10
1.0-2.0	0.58	1.49	1.26	0.84	0.45	0.30	0.31	0.45	0.73	1.43	0.65	0.24	8.74
2.0-3.0	0.31	1.88	1.66	1.42	0.75	0.52	0.35	0.54	1.09	2.33	0.78	0.11	11.73
3.0-4.0	0.13	1.68	1.55	1.64	1.20	0.71	0.36	0.41	1.11	3.58	1.00	0.03	13.37
4.0-5.0	0.03	0.99	1.28	1.53	2.05	0.57	0.15	0.09	0.98	4.90	1.08	0.02	13.68
5.0-6.0	0.02	0.68	1.17	1.19	2.11	0.17	0.02	0.03	0.79	5.25	0.92	0.00	12.36
6.0-7.0	0.00	0.45	0.98	0.77	1.53	0.01	0.00	0.00	0.74	5.07	0.53	0.00	10.09
7.0-8.0	0.00	0.38	0.79	0.54	0.87	0.00	0.00	0.00	0.42	4.47	0.26	0.00	7.75
8.0-9.0	0.00	0.27	0.67	0.28	0.30	0.00	0.00	0.00	0.25	3.34	0.09	0.00	5.21
9.0-10.0	0.00	0.14	0.50	0.05	0.05	0.00	0.00	0.00	0.07	2.38	0.01	0.00	3.21
10.0-11.0	0.00	0.07	0.32	0.01	0.01	0.00	0.00	0.00	0.02	1.50	0.01	0.00	1.93
11.0-12.0	0.00	0.03	0.13	0.00	0.00	0.00	0.00	0.00	0.01	0.86	0.00	0.00	1.03
12.0-13.0	0.00	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.47
13.0-14.0	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.22
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.09	9.35	11.19	8.82	9.79	2.66	1.68	2.03	7.30	37.36	6.49	1.25	100.00

SENSOR HEIGHT: 78m **Based on Data June 2014 to May 2015**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.

NATIONAL INSTITUTE OF WIND ENERGY
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TABLE 8B

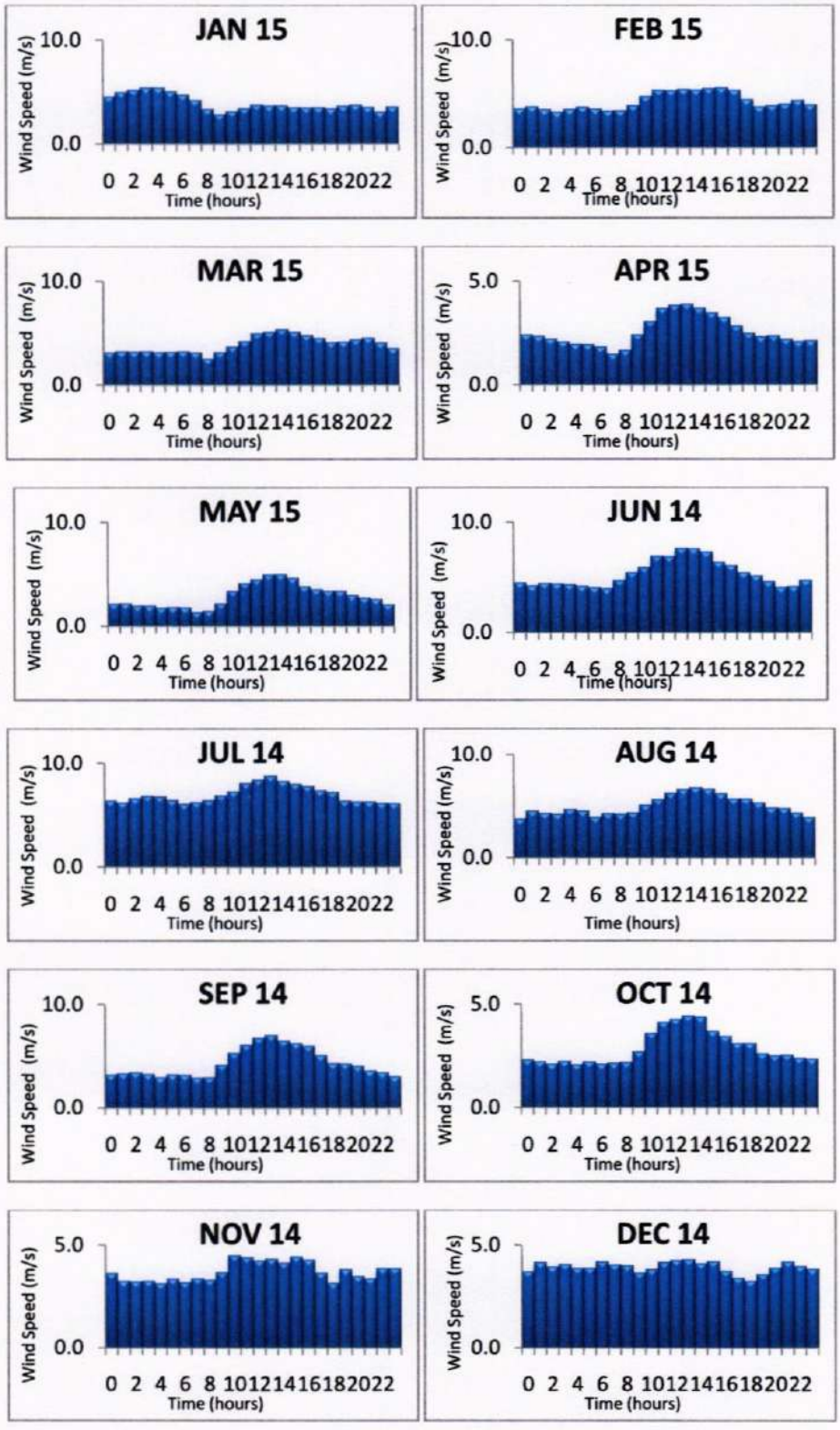
POOPARA

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED

Deg/ (m/s)	345-15	15-45	45-75	75-105	105-135	135-165	165-195	195-225	225-255	255-285	285-315	315-345	ANNUAL
0.0-1.0	0.83	1.10	0.72	0.47	0.42	0.32	0.43	0.44	0.88	1.20	1.02	0.75	8.58
1.0-2.0	0.62	1.47	1.20	0.84	0.43	0.31	0.33	0.46	0.79	1.37	0.65	0.31	8.78
2.0-3.0	0.41	2.04	1.79	1.39	0.78	0.55	0.39	0.59	1.10	2.25	0.79	0.12	12.21
3.0-4.0	0.16	1.74	1.58	1.64	1.25	0.74	0.37	0.42	1.20	3.75	1.03	0.05	13.94
4.0-5.0	0.04	1.02	1.37	1.56	2.10	0.57	0.15	0.09	1.02	5.04	1.12	0.02	14.09
5.0-6.0	0.02	0.68	1.22	1.19	2.07	0.15	0.01	0.02	0.80	5.46	0.96	0.01	12.58
6.0-7.0	0.01	0.43	1.00	0.78	1.48	0.01	0.00	0.00	0.74	5.28	0.54	0.00	10.29
7.0-8.0	0.00	0.41	0.77	0.56	0.90	0.00	0.00	0.00	0.43	4.49	0.25	0.00	7.81
8.0-9.0	0.00	0.21	0.64	0.29	0.30	0.00	0.00	0.00	0.25	3.35	0.10	0.00	5.14
9.0-10.0	0.00	0.14	0.49	0.07	0.06	0.00	0.00	0.00	0.06	2.28	0.01	0.00	3.10
10.0-11.0	0.00	0.07	0.25	0.02	0.01	0.00	0.00	0.00	0.02	1.47	0.01	0.00	1.83
11.0-12.0	0.00	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.01	0.80	0.00	0.00	0.94
12.0-13.0	0.00	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.39
13.0-14.0	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.20
14.0-15.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.07
15.0-16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03
16.0-17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0-18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0-19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0-20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.09	9.35	11.19	8.82	9.79	2.66	1.68	2.03	7.30	37.36	6.49	1.25	100.00

SENSOR HEIGHT: 80m **Based on Data June 2014 to May 2015**

Range 0--1 Extends from 0 to 0.99 m/s &
1-- 2 Extends from 1 to 1.99 m/s etc.



SENSOR HEIGHT: 50m

FIGURE 4: MEAN HOURLY WIND SPEED
(July 2014 to May 2015)

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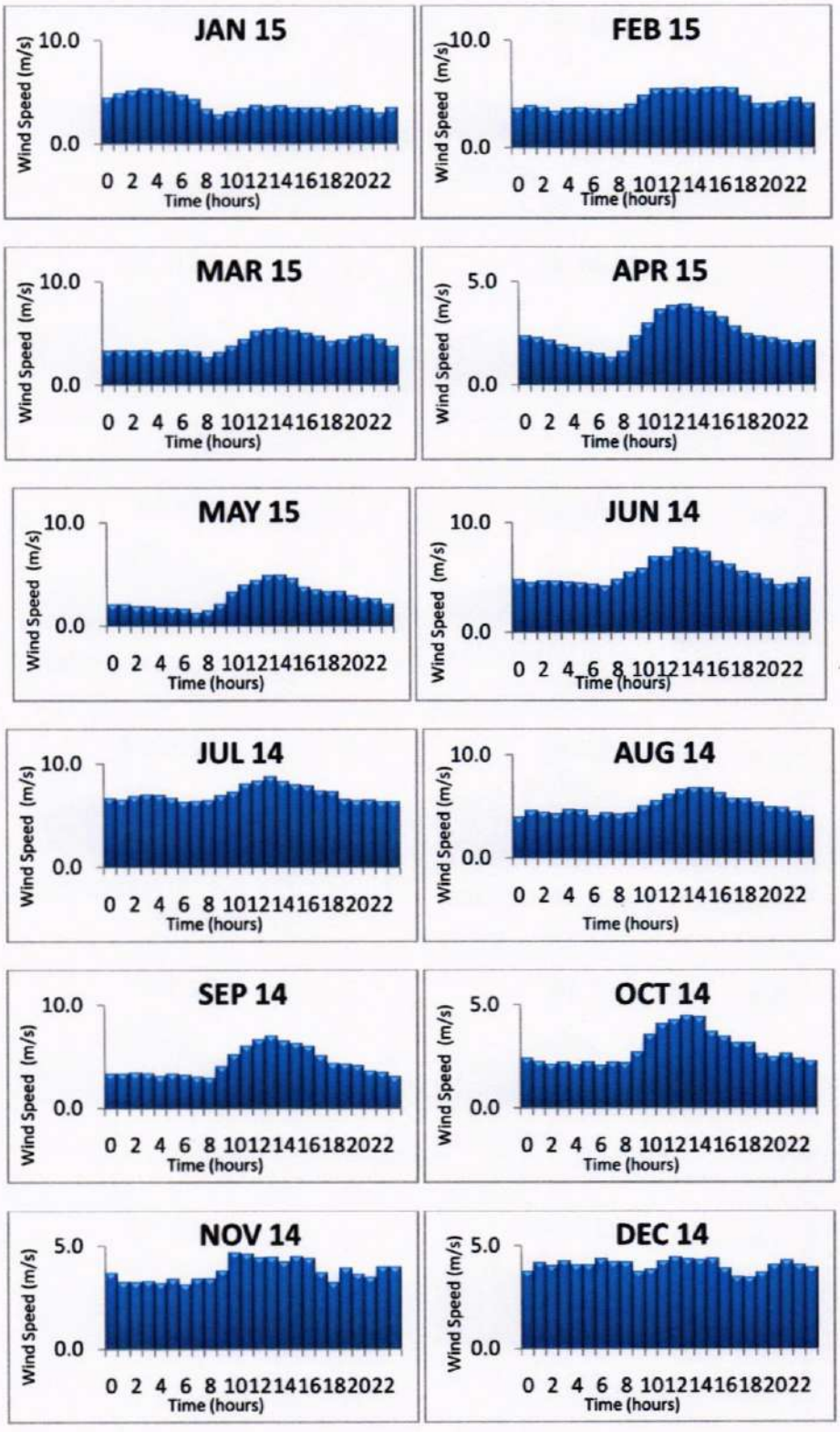
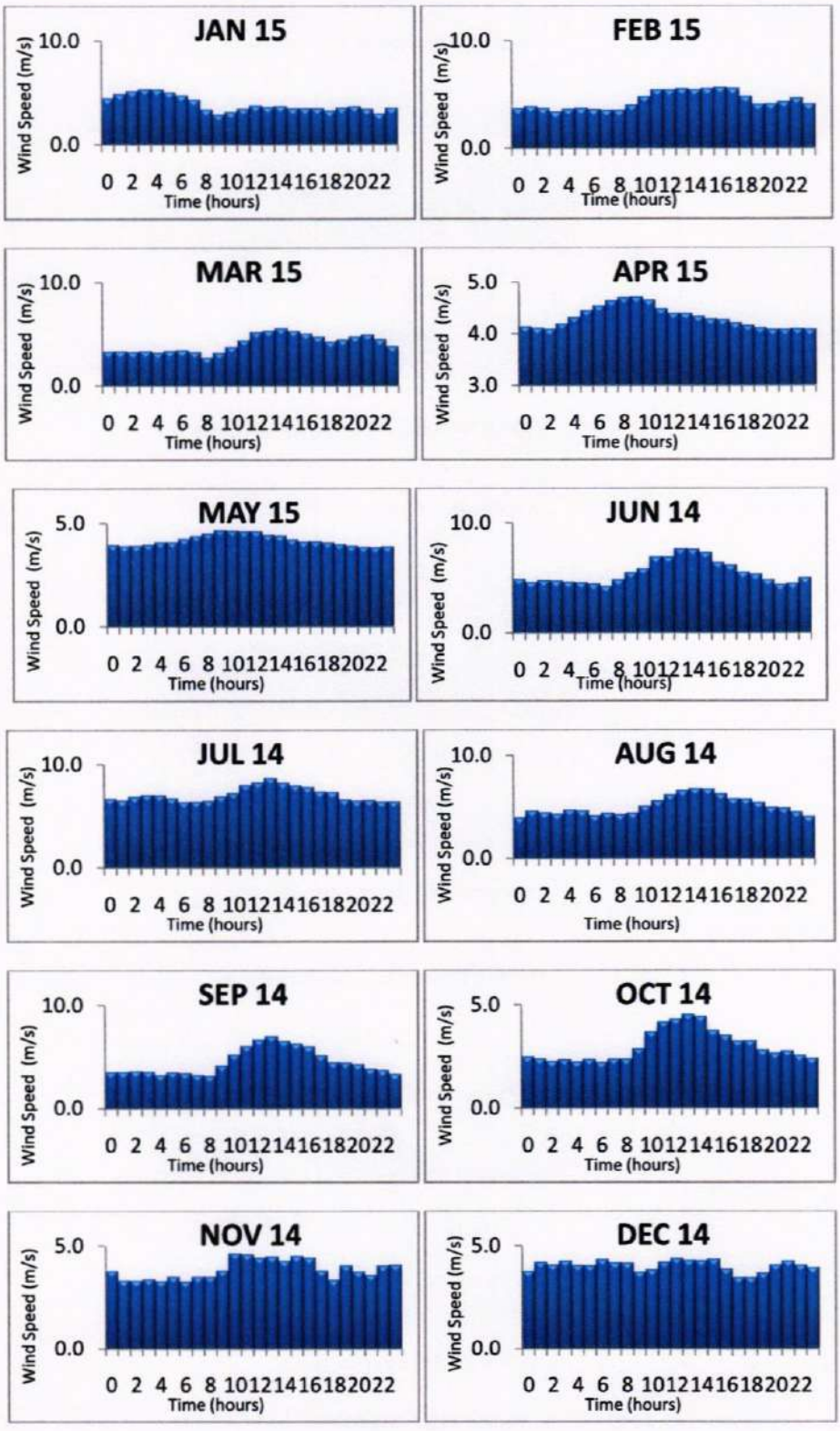


SENSOR HEIGHT: 78m

FIGURE 4A: MEAN HOURLY WIND SPEED

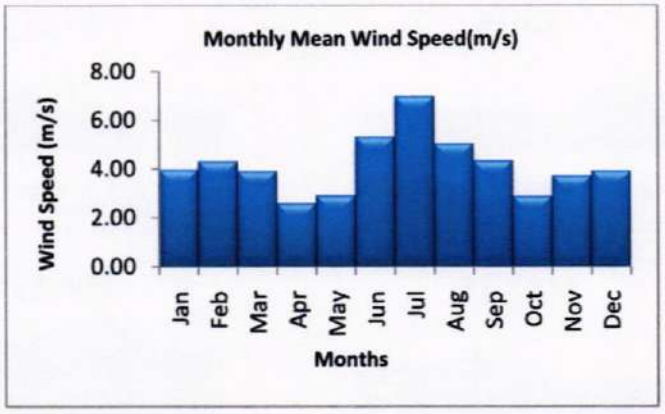
(July 2014 to May 2015)



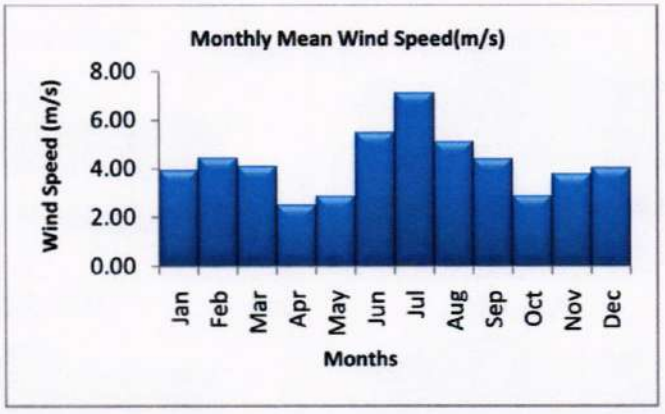
SENSOR HEIGHT: 80m

FIGURE 4B: MEAN HOURLY WIND SPEED

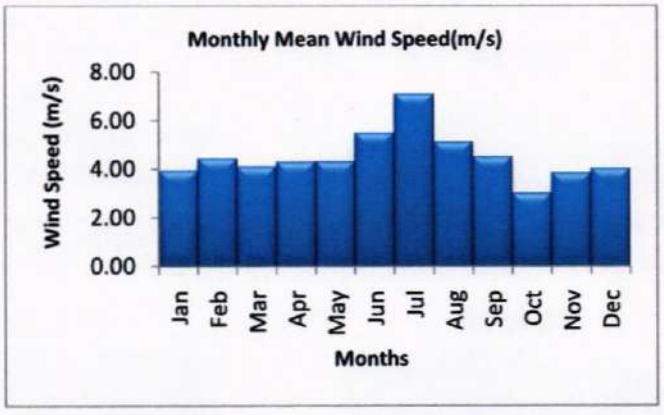
(July 2014 to May 2015)



SENSOR HEIGHT: 50m

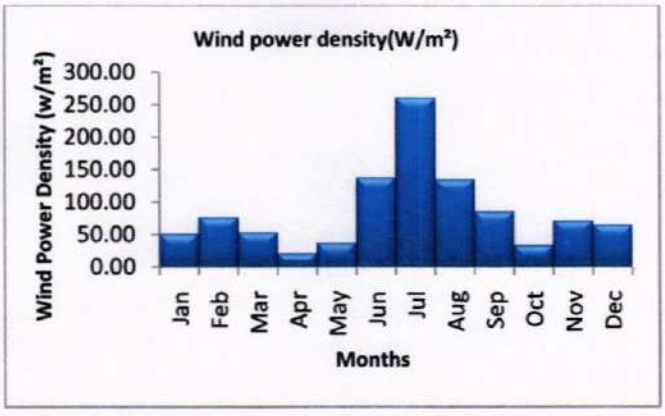


SENSOR HEIGHT: 78 m

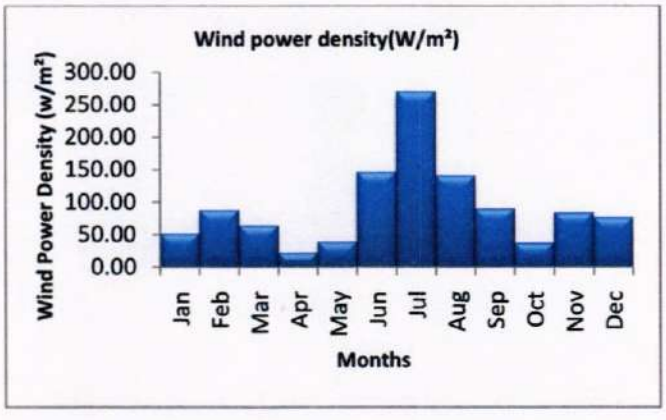


SENSOR HEIGHT: 80m

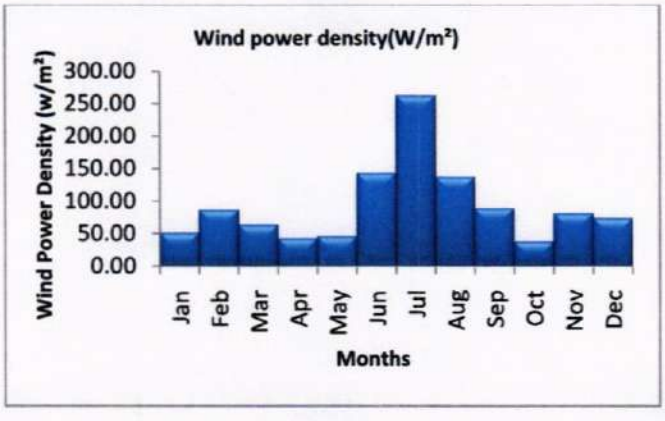
**FIGURE 5: MONTHLY MEAN WIND SPEED
(July 2014 to May 2015)**



SENSOR HEIGHT: 50m



SENSOR HEIGHT: 78m



SENSOR HEIGHT: 80m

FIGURE 6: MONTHLY MEAN WIND POWER DENSITY (July 2014 to May 2015)

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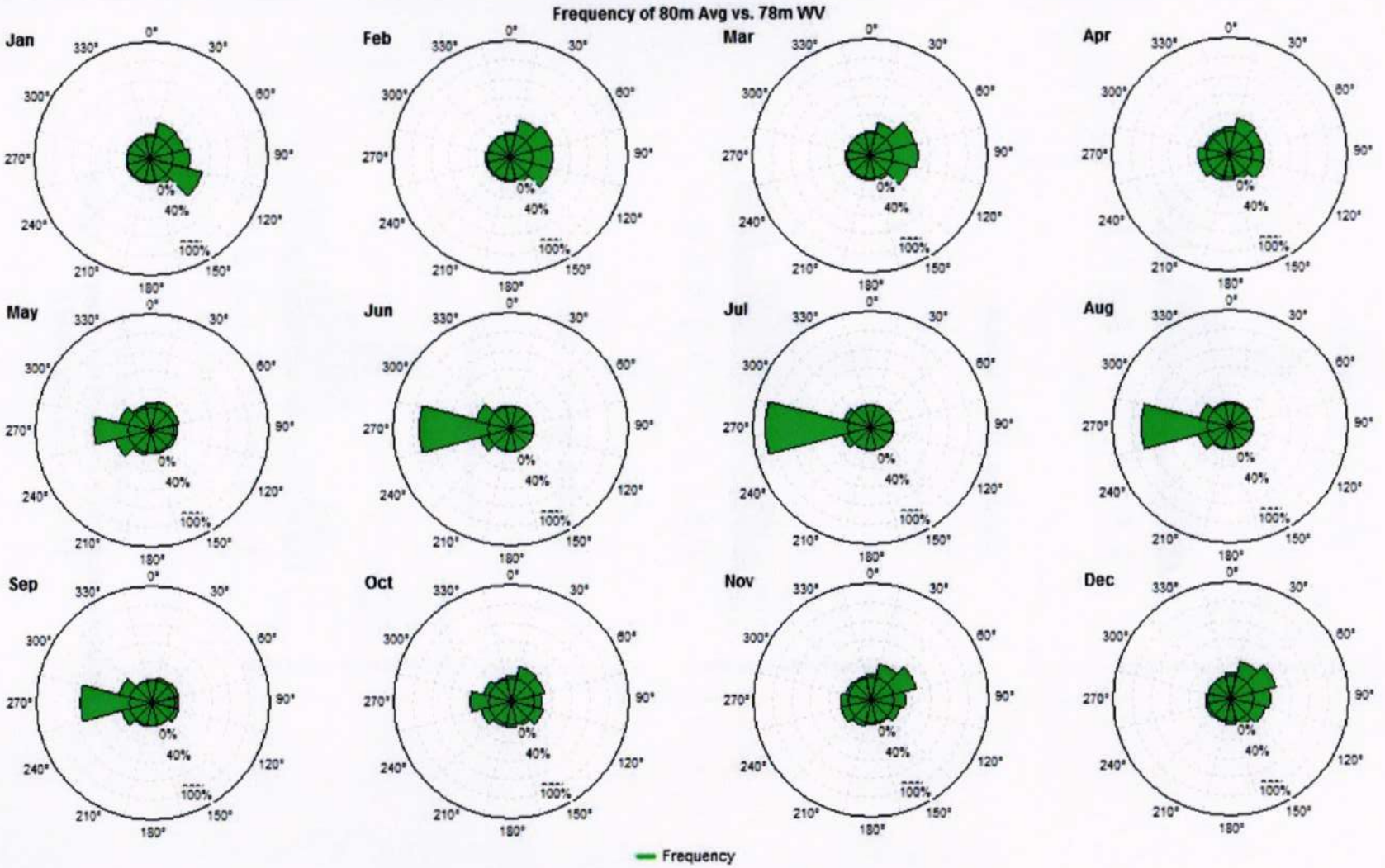

FIGURE 7: WIND ROSE
SENSOR HEIGHT: (80m Anemometer and 78m Wind vane)
(June 2014 to May 2015)

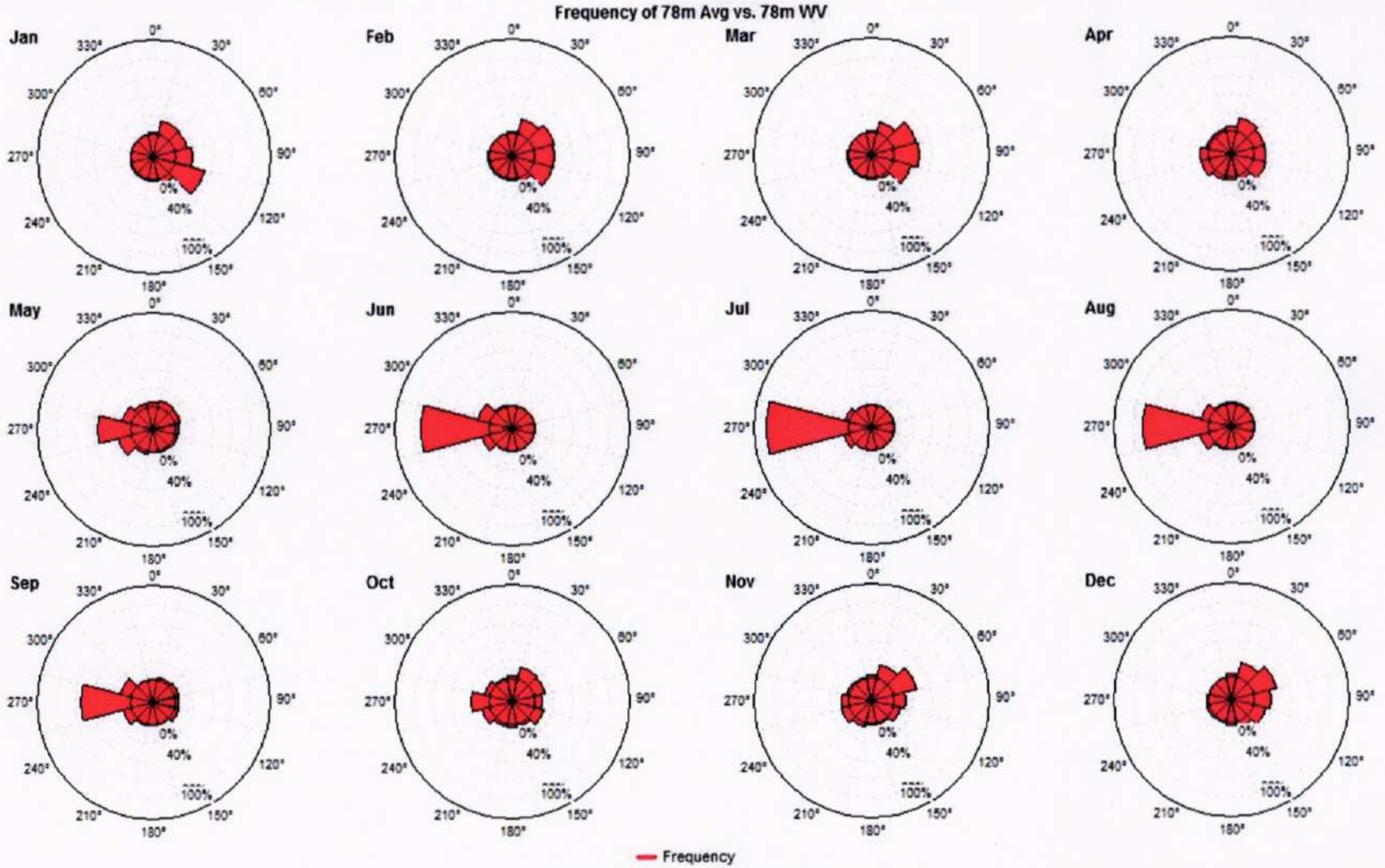

FIGURE 7A: WIND ROSE
SENSOR HEIGHT: (78m Anemometer and 78m Wind vane)
(June 2014 to May 2015)

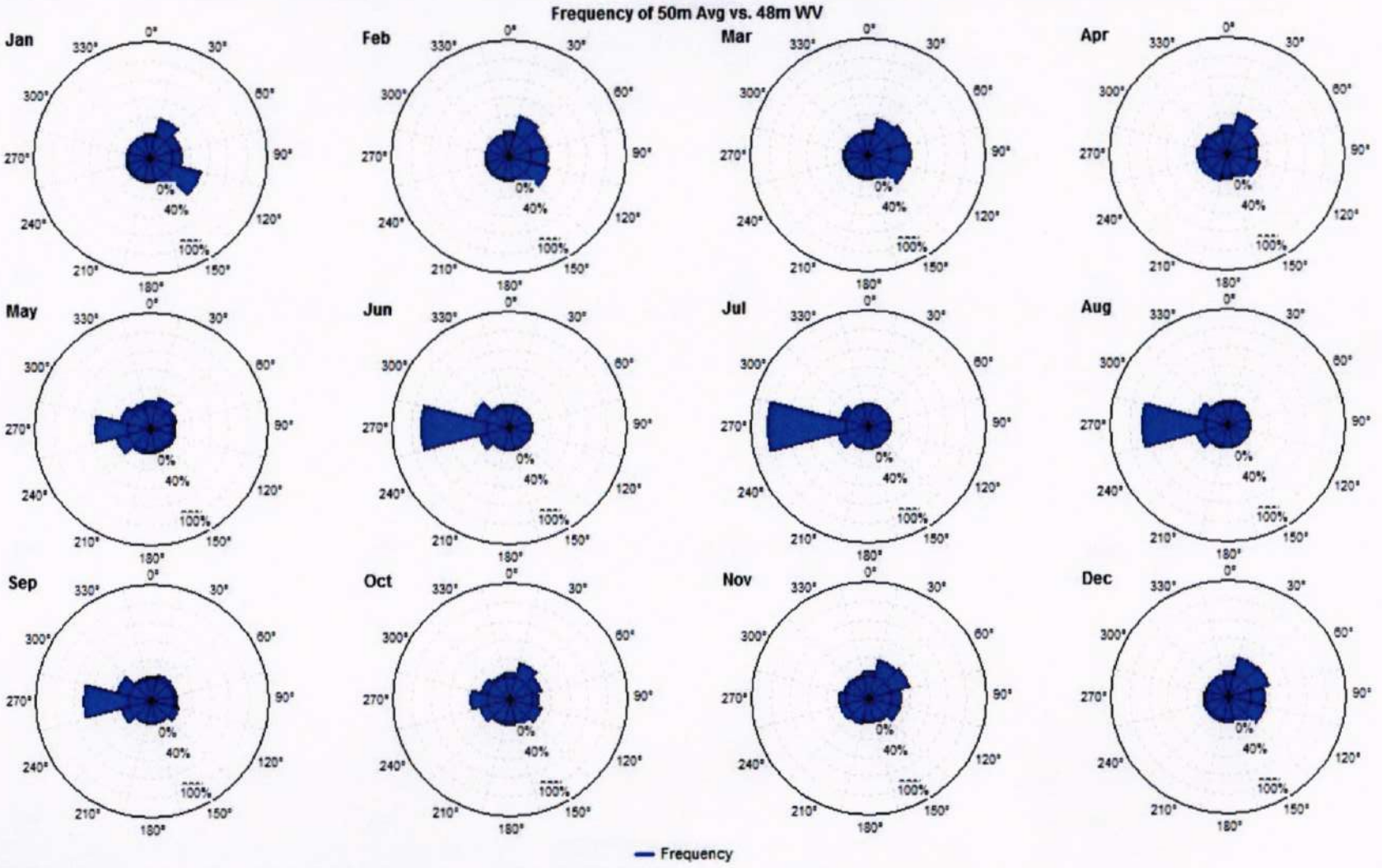

FIGURE 7B: WIND ROSE
SENSOR HEIGHT: (50m Anemometer and 48m Wind vane)
(June 2014 to May 2015)

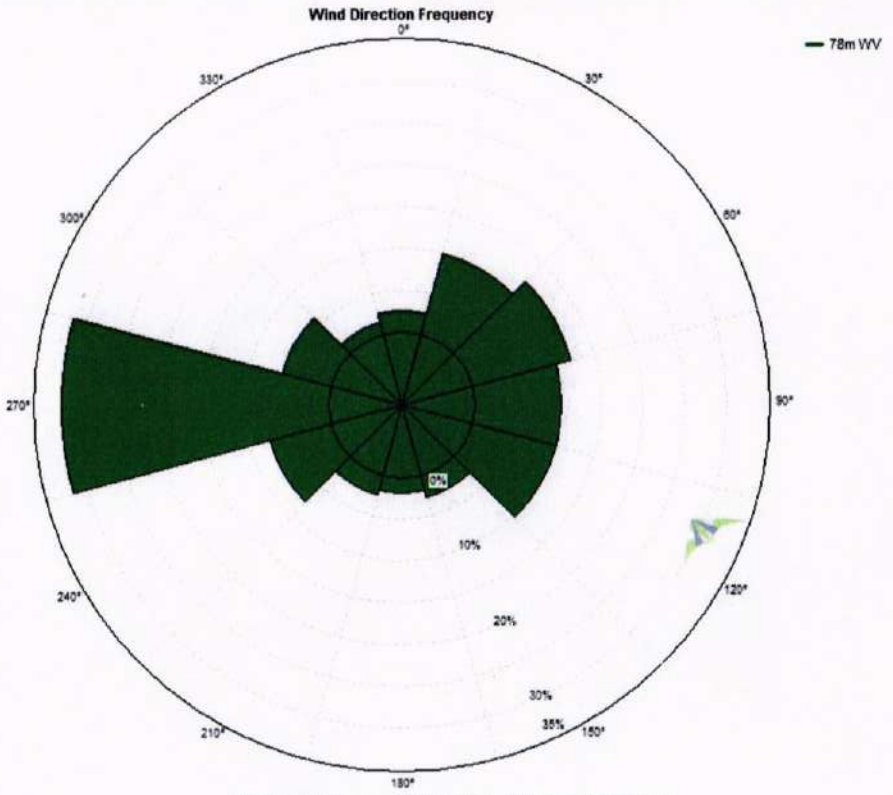

FIGURE 7C: ANNUAL WIND ROSE
SENSOR HEIGHT: (80m Anemometer and 78m Wind vane)
(June 2014 to May 2015)

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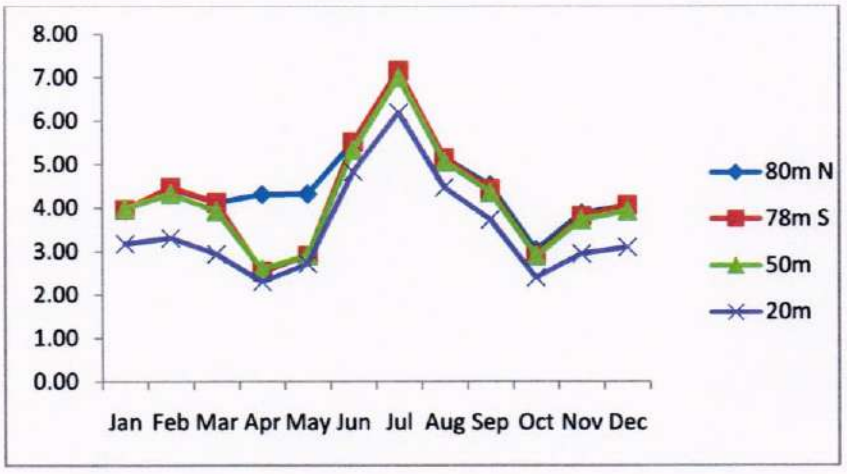
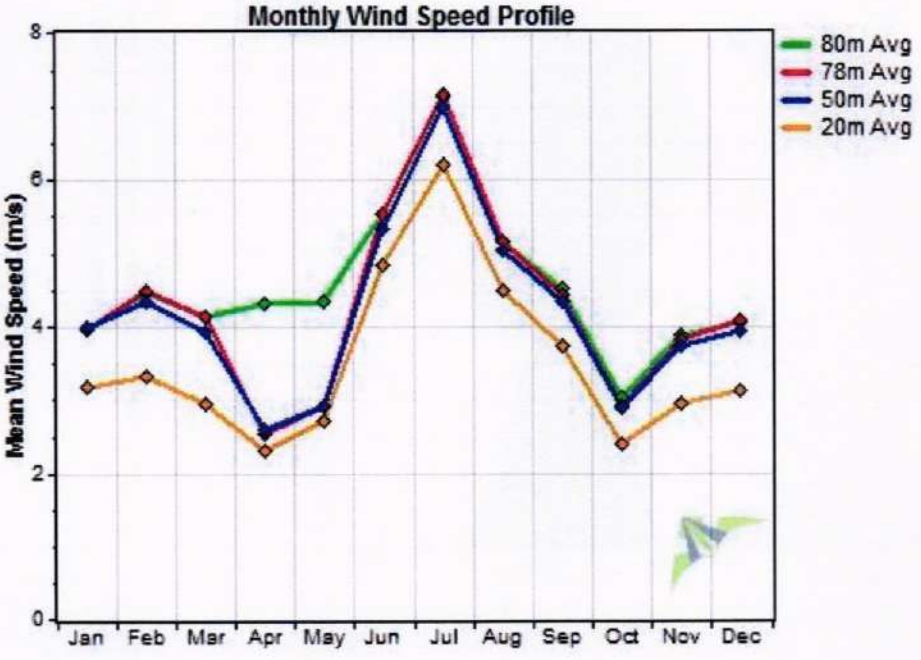


MONTHLY MEAN WIND SPEED
(JUNE 2014 TO MAY 2015)



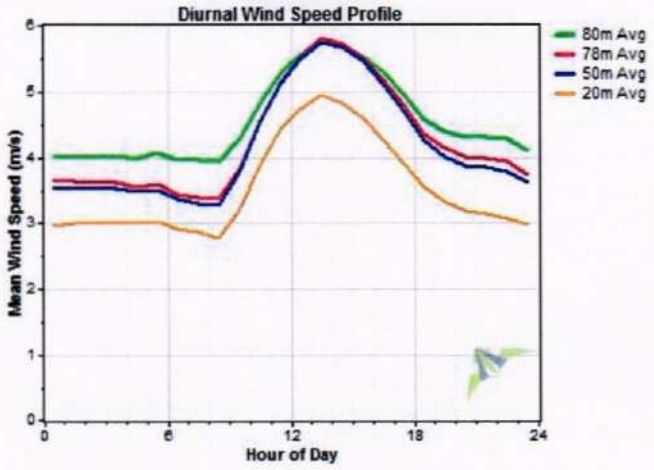


FIGURE 8: MONTHLY WIND SPEED AND DAILY WIND SPEED – POOPARA (JUNE 2014 TO MAY 2015)

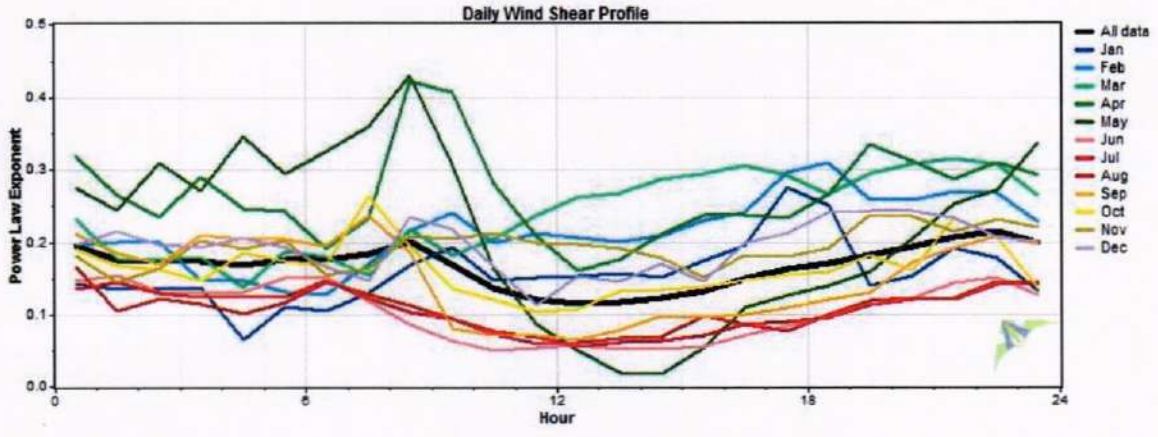


FIGURE 9: DAILY WIND SHEAR- POOPARA (JUNE 2014 TO MAY 2015)

FIGURE 10: MONTHLY WIND SHEAR- POOPARA (JUNE 2014 TO MAY 2015)

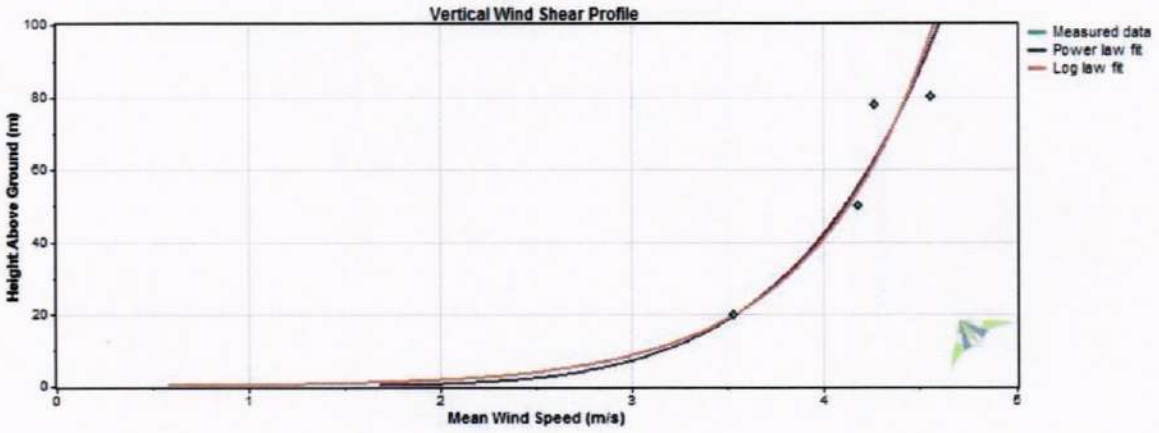
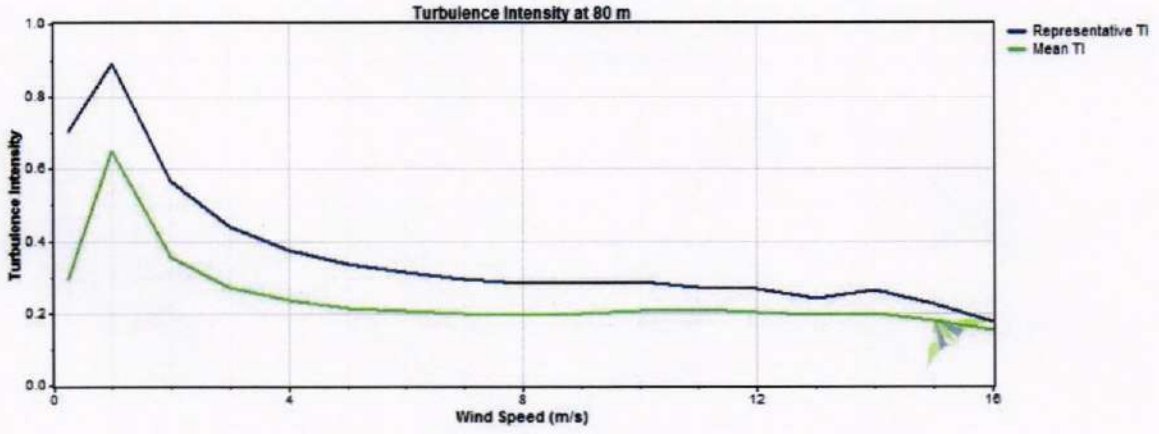
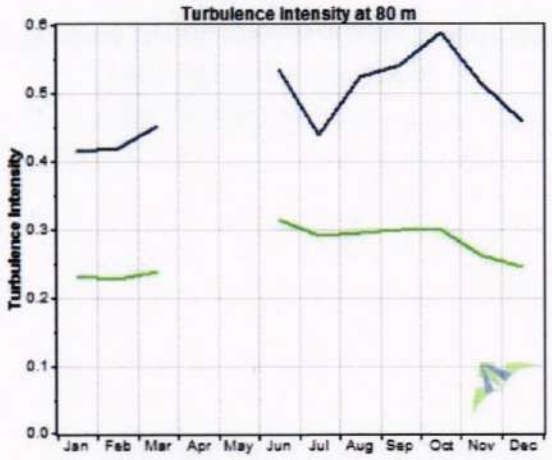
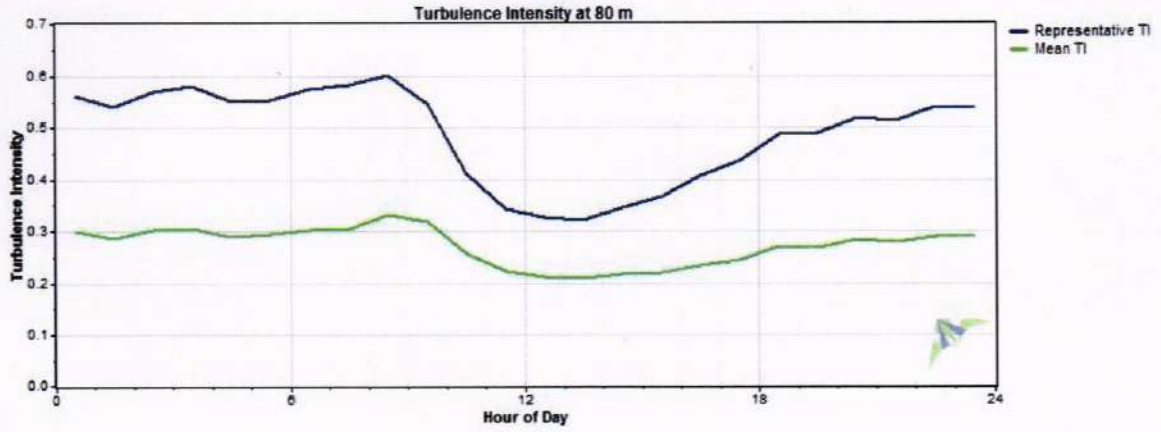


FIGURE 11: VERTICALWIND SHEAR- POOPARA (JUNE 2014 TO MAY 2015)







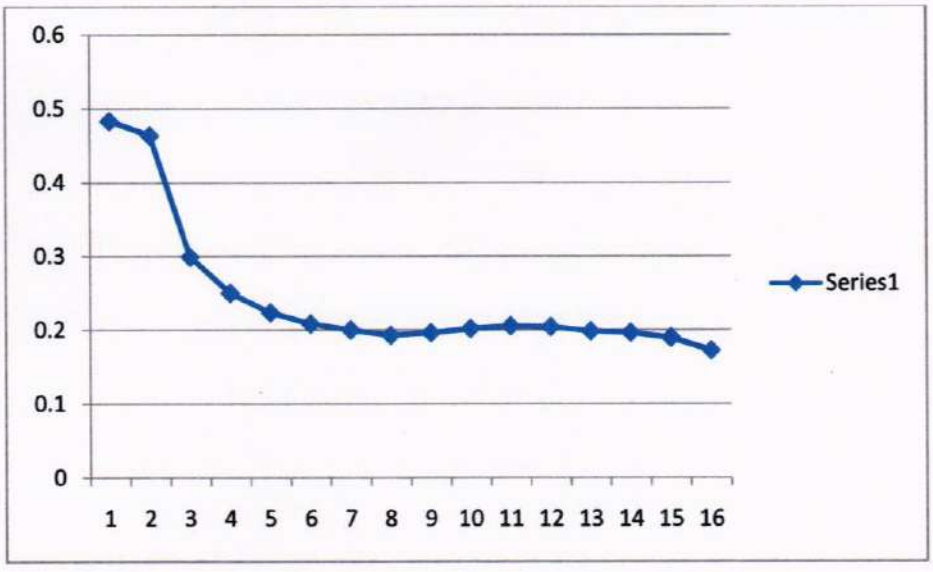
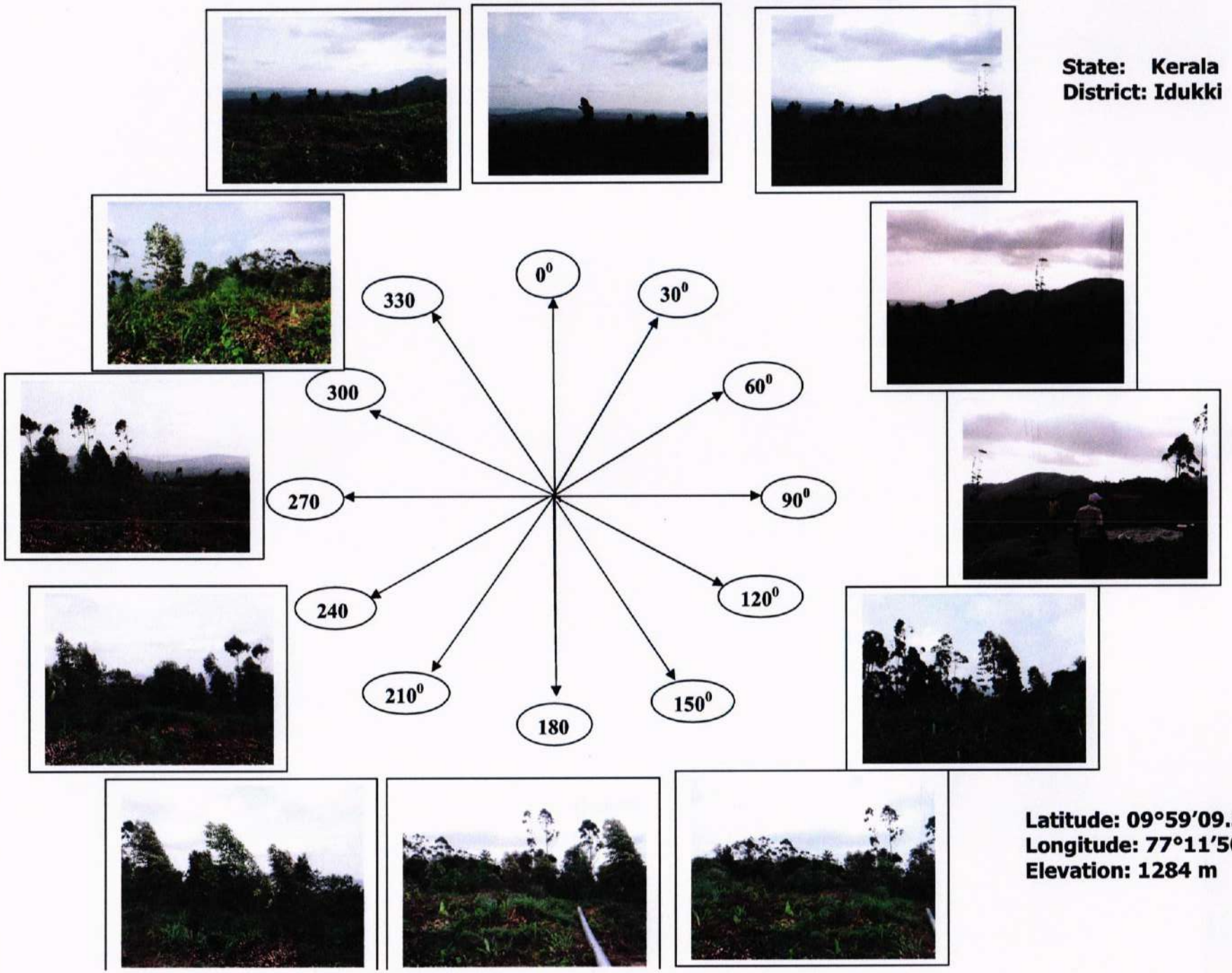


FIGURE 12: TURBULANCE INTENSITY – POOPARA (JUNE 2014 TO MAY 2015)

Annexure -2

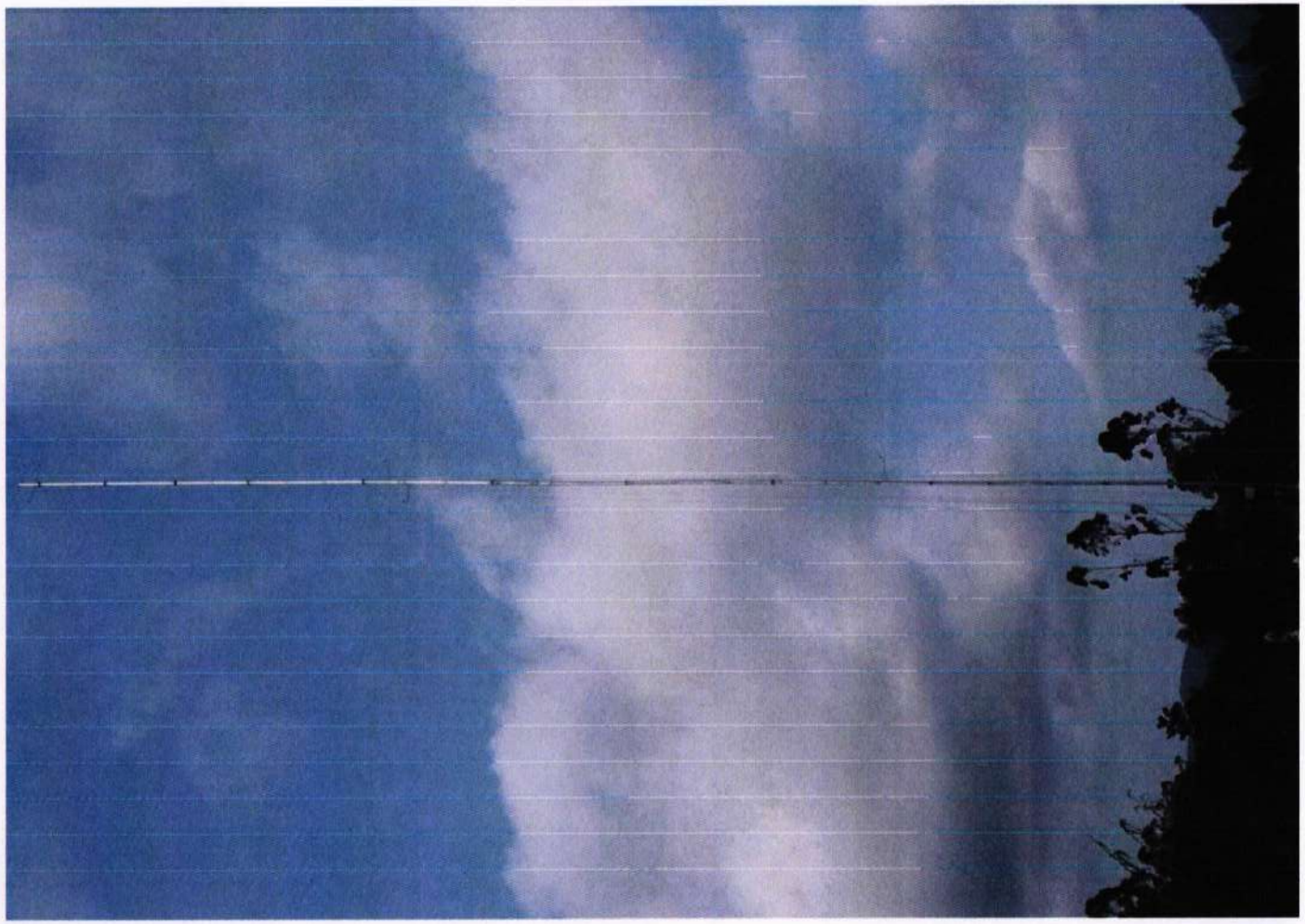
Site Photographs

Fig-1: 12 Sector wise photograph of "Poopara" site



State: Kerala
District: Idukki

Latitude: 09°59'09.5" N
Longitude: 77°11'50.0'
Elevation: 1284 m



Annexure-3

Calibration Reports

Svend Ole Hansen ApS

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WIND ENGINEERING FLUID DYNAMICS

CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

Certificate number: 11.02.1056 **Date of issue:** February 14, 2011

Type: NRG #40 **Serial number:** 179500166153

Manufacturer: NRG Systems, 110 Commerce Street, Hinesburg, Vermont 05461, USA

Client: NRG Systems, Inc., 110 Riggs Road, Hinesburg, VT 05461, USA

Anemometer received: December 16, 2010 **Anemometer calibrated:** February 13, 2011

Calibrated by: asj **Calibration procedure:** IEC 61400-12-1, MEASNET

Certificate prepared by: jsa **Approved by:** Calibration engineer, soh

Svend Ole Hansen

Calibration equation obtained: v [m/s] = 0.76832 · f [Hz] + 0.30762

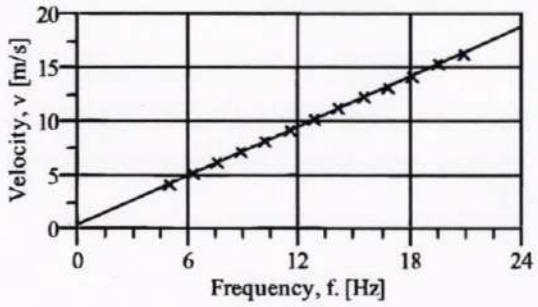
Standard uncertainty, slope: 0.00142 **Standard uncertainty, offset:** 0.04903

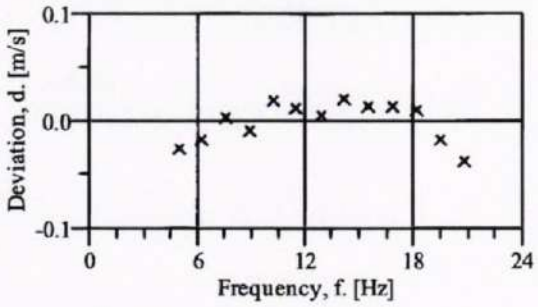
Covariance: -0.0000154 (m/s)²/Hz **Coefficient of correlation:** $\rho = 0.999989$

Absolute maximum deviation: -0.038 m/s at 16.303 m/s

Barometric pressure: 1018.7 hPa **Relative humidity:** 16.2%

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	Temperature in control room [°C]	Wind velocity, v. [m/s]	Frequency, f. [Hz]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.92	29.9	24.0	4.121	4.9950	-0.024	0.028
4	15.24	29.8	23.9	5.107	6.2687	-0.017	0.032
6	22.12	29.6	23.9	6.152	7.6007	0.004	0.038
8	29.87	29.5	23.8	7.146	8.9113	-0.008	0.043
10	39.04	29.4	23.8	8.169	10.2059	0.020	0.049
12	49.26	29.4	23.8	9.175	11.5247	0.013	0.055
13-last	60.96	29.3	23.8	10.206	12.8749	0.007	0.061
11	73.46	29.4	23.8	11.205	14.1565	0.021	0.067
9	87.50	29.5	23.8	12.232	15.5014	0.014	0.073
7	102.30	29.6	23.9	13.228	16.7982	0.014	0.079
5	118.64	29.7	23.9	14.248	18.1291	0.011	0.085
3	136.78	29.8	23.9	15.301	19.5367	-0.017	0.091
1-first	155.16	30.0	24.0	16.303	20.8675	-0.038	0.097





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EQUIPMENT USED

Serial number	Description
-	Boundary layer wind tunnel.
1256	Control cup anemometer.
-	Mounting tube, D = 25 mm
t1	PT100 temperature sensor, wind tunnel.
t2	PT100 temperature sensor, control room.
9904031	PPC500 Furness pressure manometer
X4650038	HMW71U Humidity transmitter
X4350042	PTB100AVaisala analogue barometer.
P11	Pitot tube
001551	Computer Board. 16 bit A/D data acquisition board.
-	PC dedicated to data acquisition.

Traceable calibrations of the equipment are carried out by external accredited institutions: Furness (PPC500) and Saab Metech. A real-time analysis module within the data acquisition software detects pulse frequency.

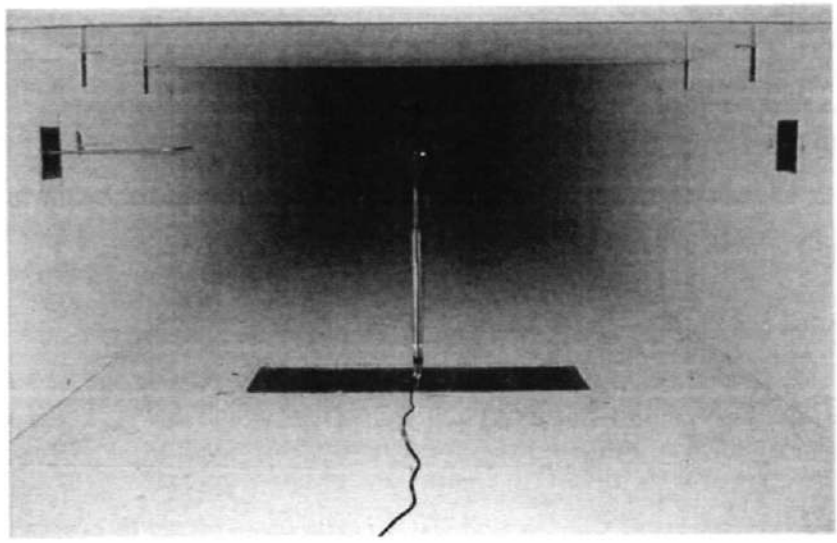

Photo of a cup anemometer in the wind tunnel. The shown anemometer is of the same type as the calibrated one.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level (k=2) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the MEASNET procedure that prescribes an absolute uncertainty less than 0.1 m/s at a mean wind velocity of 10 m/s, that is 1%. See Document 97.00.004 "MEASNET - Test report on the calibration campaign" for further details.

Certificate number: 11.02.1056

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WIND ENGINEERING FLUID DYNAMICS

CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

Certificate number: 11.02.1055 **Date of issue:** February 14, 2011

Type: NRG #40 **Serial number:** 179500166154

Manufacturer: NRG Systems, 110 Commerce Street, Hinesburg, Vermont 05461, USA

Client: NRG Systems, Inc., 110 Riggs Road, Hinesburg, VT 05461, USA

Anemometer received: December 16, 2010 **Anemometer calibrated:** February 13, 2011

Calibrated by: asj **Calibration procedure:** IEC 61400-12-1, MEASNET

Certificate prepared by: jsa **Approved by:** Calibration engineer, soh

Svend Ole Hansen

Calibration equation obtained: v [m/s] = 0.76769 · f [Hz] + 0.29677

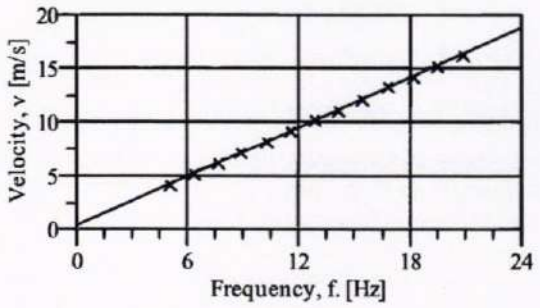
Standard uncertainty, slope: 0.00186 **Standard uncertainty, offset:** 0.06661

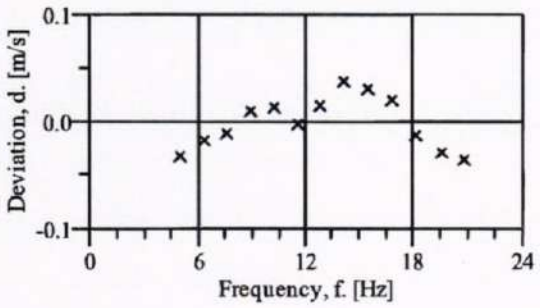
Covariance: -0.0000264 (m/s)²/Hz **Coefficient of correlation:** ρ = 0.999981

Absolute maximum deviation: 0.039 m/s at 11.189 m/s

Barometric pressure: 1018.5 hPa **Relative humidity:** 16.2%

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	Temperature in control room [°C]	Wind velocity, v. [m/s]	Frequency, f. [Hz]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.95	29.9	23.9	4.128	5.0308	-0.031	0.028
4	15.42	29.8	23.8	5.138	6.3272	-0.016	0.033
6	22.01	29.7	23.8	6.137	7.6198	-0.010	0.038
8	29.86	29.5	23.8	7.147	8.9079	0.011	0.043
10	38.89	29.4	23.8	8.154	10.2170	0.014	0.049
12	49.40	29.4	23.8	9.189	11.5854	-0.002	0.055
13-last	60.77	29.3	23.8	10.192	12.8668	0.017	0.061
11	73.22	29.4	23.8	11.189	14.1375	0.039	0.066
9	87.11	29.5	23.8	12.205	15.4706	0.032	0.072
7	102.61	29.6	23.8	13.250	16.8459	0.021	0.079
5	118.57	29.7	23.8	14.245	18.1843	-0.011	0.085
3	136.49	29.8	23.8	15.287	19.5637	-0.029	0.091
1-first	154.71	30.1	23.9	16.281	20.8681	-0.036	0.097





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EQUIPMENT USED

Serial number	Description
-	Boundary layer wind tunnel.
1256	Control cup anemometer.
-	Mounting tube, D = 25 mm
t1	PT100 temperature sensor, wind tunnel.
t2	PT100 temperature sensor, control room.
9904031	PPC500 Furness pressure manometer
X4650038	HMW71U Humidity transmitter
X4350042	PTB100AVaisala analogue barometer.
P11	Pitot tube
001551	Computer Board. 16 bit A/D data acquisition board.
-	PC dedicated to data acquisition.

Traceable calibrations of the equipment are carried out by external accredited institutions: Furness (PPC500) and Saab Metech. A real-time analysis module within the data acquisition software detects pulse frequency.

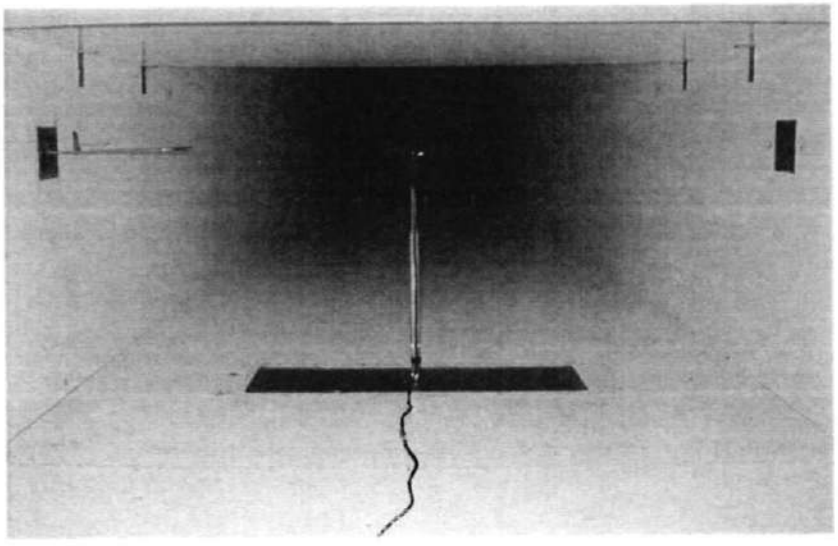

Photo of a cup anemometer in the wind tunnel. The shown anemometer is of the same type as the calibrated one.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level (k=2) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the MEASNET procedure that prescribes an absolute uncertainty less than 0.1 m/s at a mean wind velocity of 10 m/s, that is 1%. See Document 97.00.004 "MEASNET - Test report on the calibration campaign" for further details.

Certificate number: 11.02.1055

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WIND
ENGINEERING
FLUID
DYNAMICS

CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

Certificate number: 11.02.1052 **Date of issue:** February 14, 2011

Type: NRG #40 **Serial number:** 179500166157

Manufacturer: NRG Systems, 110 Commerce Street, Hinesburg, Vermont 05461, USA

Client: NRG Systems, Inc., 110 Riggs Road, Hinesburg, VT 05461, USA

Anemometer received: December 16, 2010 **Anemometer calibrated:** February 13, 2011

Calibrated by: asj **Calibration procedure:** IEC 61400-12-1, MEASNET

Certificate prepared by: jsa **Approved by:** Calibration engineer, soh

Svend Ole Hansen

Calibration equation obtained: v [m/s] = 0.76527 · f [Hz] + 0.31621

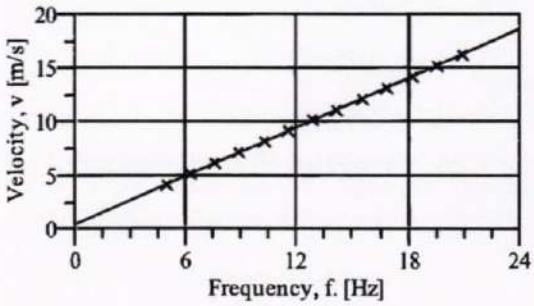
Standard uncertainty, slope: 0.00130 **Standard uncertainty, offset:** 0.04344

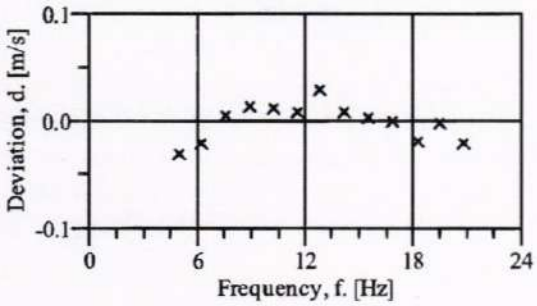
Covariance: -0.0000128 (m/s)²/Hz **Coefficient of correlation:** $\rho = 0.999991$

Absolute maximum deviation: 0.030 m/s at 10.194 m/s

Barometric pressure: 1018.3 hPa **Relative humidity:** 16.2%

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	Temperature in control room [°C]	Wind velocity, v. [m/s]	Frequency, f. [Hz]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.90	29.8	24.1	4.118	5.0065	-0.030	0.028
4	15.31	29.7	24.1	5.119	6.3011	-0.019	0.032
6	21.98	29.6	24.0	6.132	7.5931	0.005	0.038
8	29.72	29.5	24.0	7.130	8.8843	0.015	0.043
10	38.92	29.4	24.0	8.157	10.2292	0.013	0.049
12	49.14	29.3	24.0	9.164	11.5497	0.010	0.055
13-last	60.81	29.2	23.9	10.194	12.8683	0.030	0.061
11	72.92	29.3	24.0	11.165	14.1646	0.009	0.066
9	86.97	29.4	24.0	12.195	15.5168	0.004	0.072
7	102.20	29.5	24.0	13.223	16.8632	0.001	0.078
5	118.65	29.6	24.0	14.250	18.2308	-0.018	0.085
3	135.98	29.8	24.1	15.259	19.5277	-0.002	0.091
1-first	154.41	30.0	24.0	16.265	20.8656	-0.019	0.097





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CAL Reg.nr. 452
Accreditation to ISO 17025

EQUIPMENT USED

Serial number	Description
-	Boundary layer wind tunnel.
1256	Control cup anemometer.
-	Mounting tube, D = 25 mm
t1	PT100 temperature sensor, wind tunnel.
t2	PT100 temperature sensor, control room.
9904031	PPC500 Furness pressure manometer
X4650038	HMW71U Humidity transmitter
X4350042	PTB100AVaisala analogue barometer.
P11	Pitot tube
001551	Computer Board. 16 bit A/D data acquisition board.
-	PC dedicated to data acquisition.

Traceable calibrations of the equipment are carried out by external accredited institutions: Furness (PPC500) and Saab Metech. A real-time analysis module within the data acquisition software detects pulse frequency.

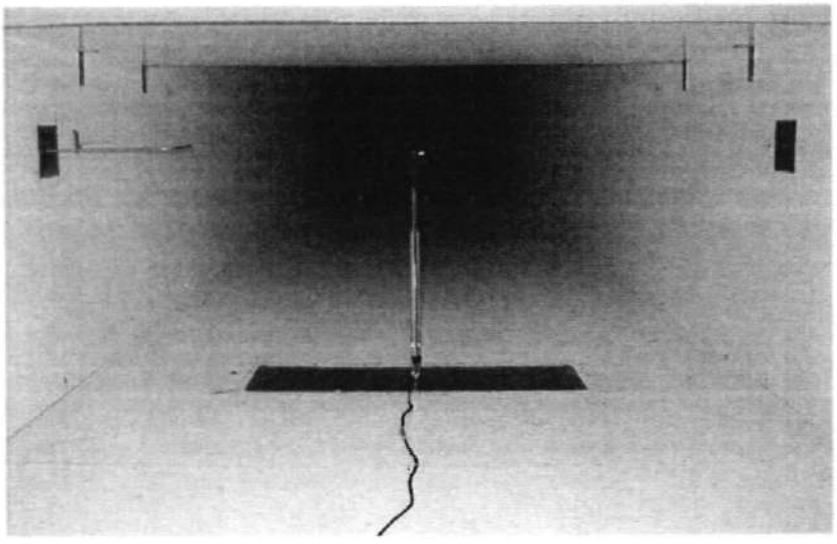

Photo of a cup anemometer in the wind tunnel. The shown anemometer is of the same type as the calibrated one.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level (k=2) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the MEASNET procedure that prescribes an absolute uncertainty less than 0.1 m/s at a mean wind velocity of 10 m/s, that is 1%. See Document 97.00.004 "MEASNET - Test report on the calibration campaign" for further details.

Certificate number: 11.02.1052

Svend Ole Hansen ApS

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WIND ENGINEERING FLUID DYNAMICS

CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

Certificate number: 11.02.1051 **Date of issue:** February 14, 2011

Type: NRG #40 **Serial number:** 179500166158

Manufacturer: NRG Systems, 110 Commerce Street, Hinesburg, Vermont 05461, USA

Client: NRG Systems, Inc., 110 Riggs Road, Hinesburg, VT 05461, USA

Anemometer received: December 16, 2010 **Anemometer calibrated:** February 13, 2011

Calibrated by: asj **Calibration procedure:** IEC 61400-12-1, MEASNET

Certificate prepared by: jsa **Approved by:** Calibration engineer, soh

Svend Ole Hansen

Calibration equation obtained: v [m/s] = 0.76479 · f [Hz] + 0.32414

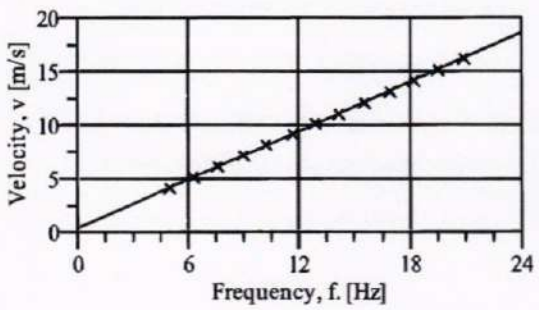
Standard uncertainty, slope: 0.00175 **Standard uncertainty, offset:** 0.05723

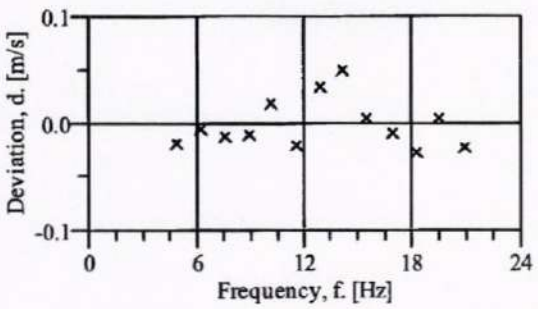
Covariance: -0.0000232 (m/s)²/Hz **Coefficient of correlation:** $\rho = 0.999983$

Absolute maximum deviation: 0.050 m/s at 11.188 m/s

Barometric pressure: 1018.1 hPa **Relative humidity:** 16.2%

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	Temperature in control room [°C]	Wind velocity, v. [m/s]	Frequency, f. [Hz]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.86	29.8	23.9	4.110	4.9739	-0.018	0.028
4	15.19	29.7	23.8	5.100	6.2492	-0.004	0.032
6	21.95	29.6	23.8	6.129	7.6037	-0.010	0.038
8	30.08	29.4	23.8	7.174	8.9681	-0.009	0.043
10	38.61	29.3	23.8	8.126	10.1755	0.020	0.049
12	49.30	29.3	23.8	9.180	11.6046	-0.019	0.055
13-last	60.93	29.2	23.8	10.205	12.8745	0.035	0.061
11	73.21	29.3	23.7	11.188	14.1391	0.050	0.066
9	87.18	29.4	23.8	12.211	15.5344	0.006	0.072
7	102.42	29.5	23.8	13.238	16.8963	-0.008	0.079
5	118.73	29.6	23.8	14.256	18.2520	-0.027	0.085
3	135.91	29.7	23.9	15.255	19.5149	0.007	0.091
1-first	155.15	30.0	23.9	16.306	20.9250	-0.022	0.097





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CAL Reg.nr. 452
Accreditation to ISO 17025

EQUIPMENT USED

Serial number	Description
-	Boundary layer wind tunnel.
1256	Control cup anemometer.
-	Mounting tube, D = 25 mm
t1	PT100 temperature sensor, wind tunnel.
t2	PT100 temperature sensor, control room.
9904031	PPC500 Furness pressure manometer
X4650038	HMW71U Humidity transmitter
X4350042	PTB100AVaisala analogue barometer.
P11	Pitot tube
001551	Computer Board. 16 bit A/D data acquisition board.
-	PC dedicated to data acquisition.

Traceable calibrations of the equipment are carried out by external accredited institutions: Furness (PPC500) and Saab Metech. A real-time analysis module within the data acquisition software detects pulse frequency.

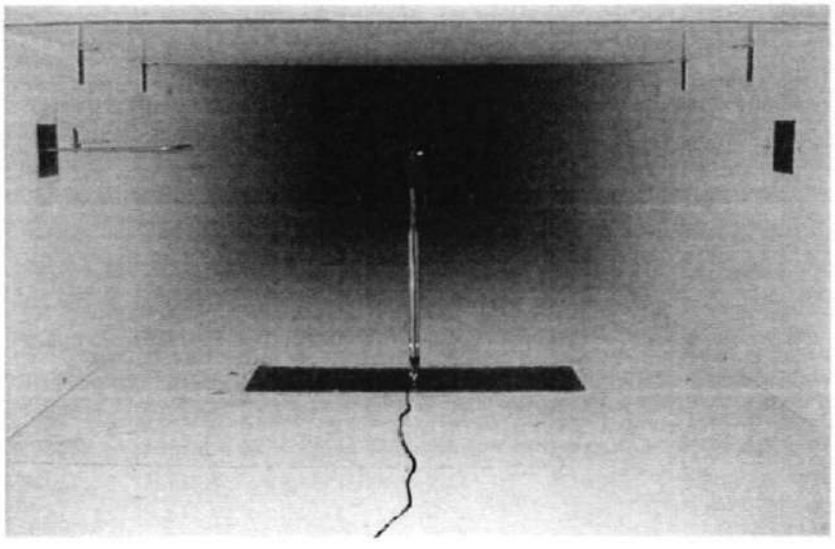

Photo of a cup anemometer in the wind tunnel. The shown anemometer is of the same type as the calibrated one.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level (k=2) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the MEASNET procedure that prescribes an absolute uncertainty less than 0.1 m/s at a mean wind velocity of 10 m/s, that is 1%. See Document 97.00.004 "MEASNET - Test report on the calibration campaign" for further details.

Certificate number: 11.02.1051