New Mexico State University
Agricultural Science Center at Clovis
Wind Monitoring Project
Yearly Performance Report

2010

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Prepared for:

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50 Meter Tower at New Mexico State University
Agricultural Science Center at Clovis

Wind Monitoring Project

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1 Introduction

This document presents a summary of results of the 2010 wind monitoring results for the Clovis Agricultural Experiment Station of New Mexico State University. As in previous years, 2010 again showed that the site is "Class IV+ wind site", with an average annual wind speed of 7.48 m/s at 50 meters[1]; a Class IV site is considered suitable for large scale wind energy development.

The highest monthly average speed at 50 meters was for April, peaking over 9 m/s, and the lowest one was February with 6.23 m/s. This is unusual since February should be the windiest month all year around. However, consulting some other meteorological sources, the average wind speed looks consistent with the results from the tall tower installed at the NMSU AgSc at Clovis. This could be caused by El Niño Southern Oscillation phenomenon, which occurred during the winter 2009-2010.

The 2010 report incorporates again estimated energy yields for a 1.5 MW wind turbine at 65 m hub height, as well as the potential wind farm capacity factor which was very similar to the year 2009, approximately 47%. Furthermore, the long term average speed differences between day and night are also presented; the values with negative percentage indicate that the wind speed during night is less by 11% than during the day for 2010. As in past years, the prevailing wind direction for 2010, according to the wind roses at 40 m was the Southwest Quadrant (between 180 and 270 Degrees) and the wind rose at 50 meters shows that prevailing wind direction was the Southeast Quadrant (between 90 and 180 Degrees), although this could be inaccurate since the wind vane direction at 50 meters could have been already discalibrated.

Moreover, data recovery rate for this year was really low, only 64.8%. This was caused by some sensors issues, which required to be replaced early during year 2011. Therefore, this report shows only results from Anemometer 1 at 50 meters, since data from Anemometer 2 were invalid because this sensor had not been working properly since January 19, 2010. Moreover, during October, and probably due to a battery issue, there is not data collected at all by the data logger for this month. Also sometime during October, Anemometer 1 started working improperly, thus all data at 50 meters for November and December were lost.

[1] 1 meter = 3.28 ft.

This data summary presents the following information:

- *Monthly Average Wind Speed;*
- *Hourly Average Wind Speed;*
- *Frequency Distribution at all Levels*
- *Average Speed: Day vs. Night;*
- *Monthly Yielded Energy for a 1.5 MW Wind Turbine at 65 m Height*
- *Maximum Gust;*
- *Wind Shear;*
- *Turbulence Intensity;*
- *Data Recovery;*
- *Standard Deviation;*
- *Temperature; and*
- *Yearly Wind Direction.*

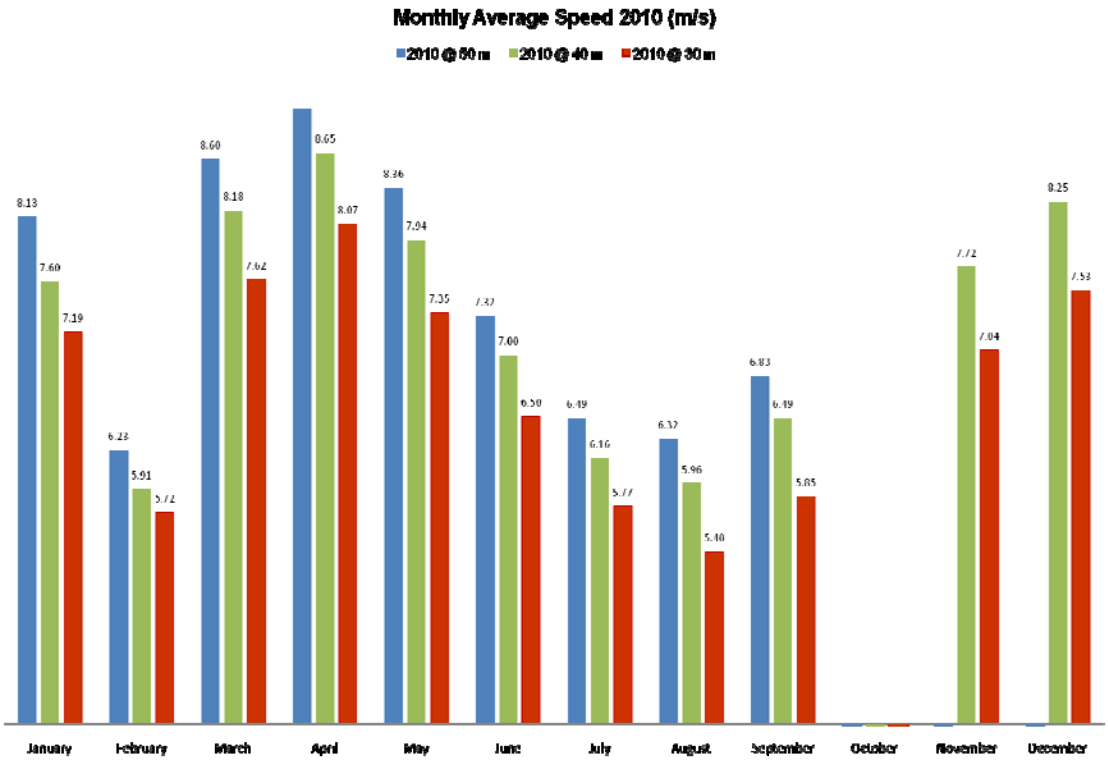
2 Monthly Average Wind Speed

The wind speed is the most important factor for the amount of energy a wind turbine can convert into electricity; the energy that wind has varies with the cube (third power) of the average wind speed. Thus, the filtered raw data results for average wind speed are provided for all three-measurement levels.

Monthly Average Wind Speed 2010 (Table)

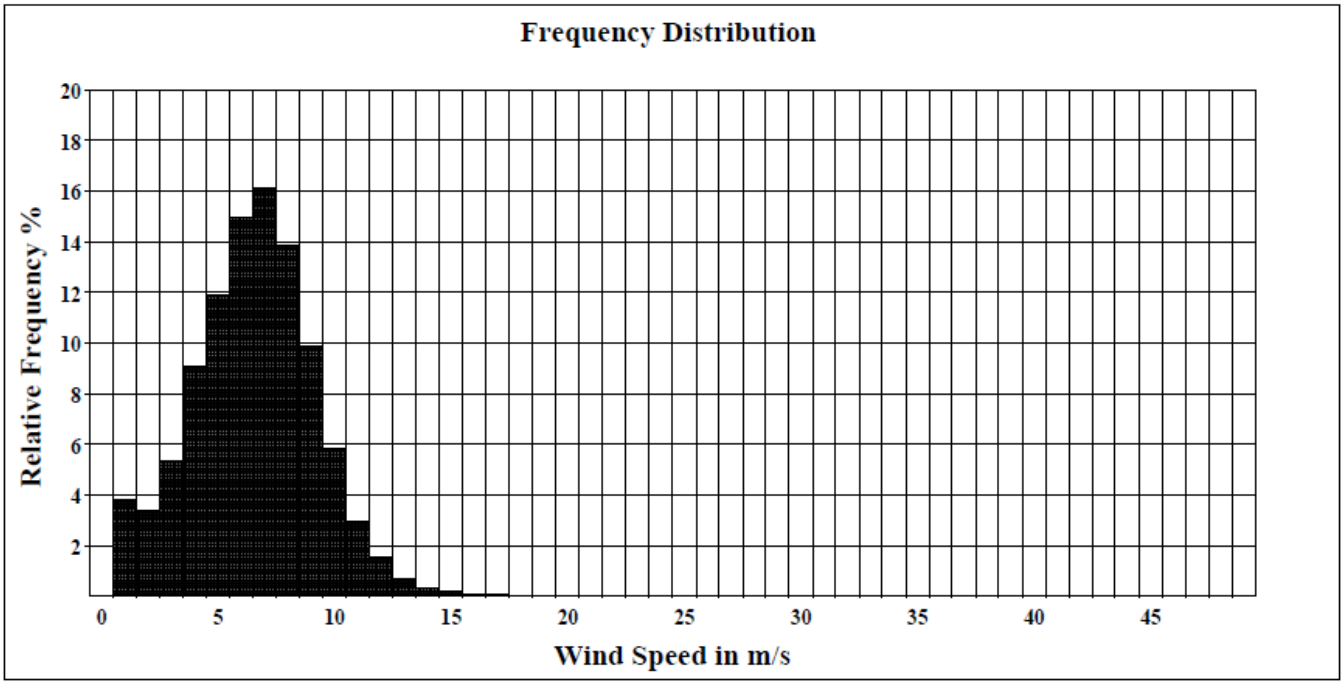
	50 m		40 m		30 m	
Month	m/s	mph	m/s	mph	m/s	mph
January	8.13	18.19	7.60	17.00	7.19	16.08
February	6.23	13.94	5.91	13.22	5.72	12.80
March	8.60	19.24	8.18	18.30	7.62	17.05
April	9.07	20.29	8.65	19.35	8.07	18.05
May	8.36	18.70	7.94	17.76	7.35	16.44
June	7.32	16.37	7.00	15.66	6.50	14.54
July	6.49	14.52	6.16	13.78	5.77	12.91
August	6.32	14.14	5.96	13.33	5.40	12.08
September	6.83	15.28	6.49	14.52	5.85	13.09
October	N/A	N/A	N/A	N/A	N/A	N/A
November	N/A	N/A	7.72	17.27	7.04	15.75
December	N/A	N/A	8.25	18.45	7.53	16.84
Average	7.48	16.74	7.26	16.24	6.73	15.06

Monthly Average Wind Speed 2010 (Graph)

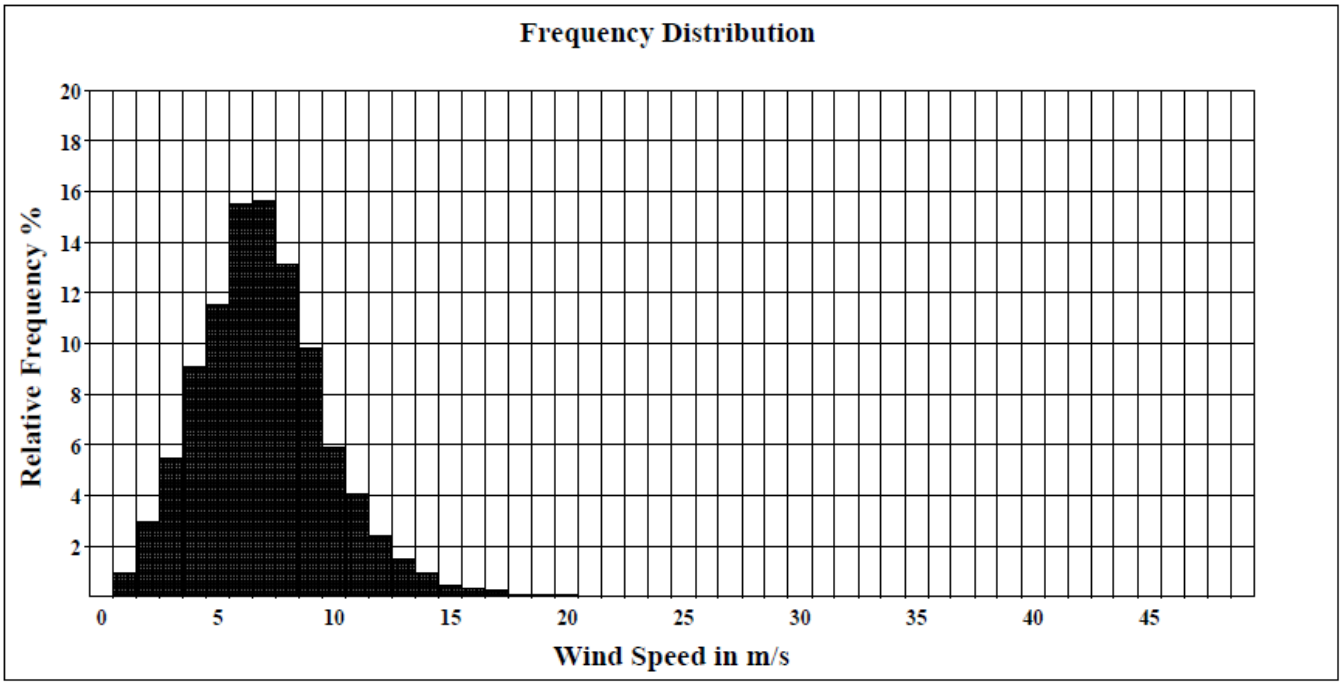


3 Frequency Distribution at all levels

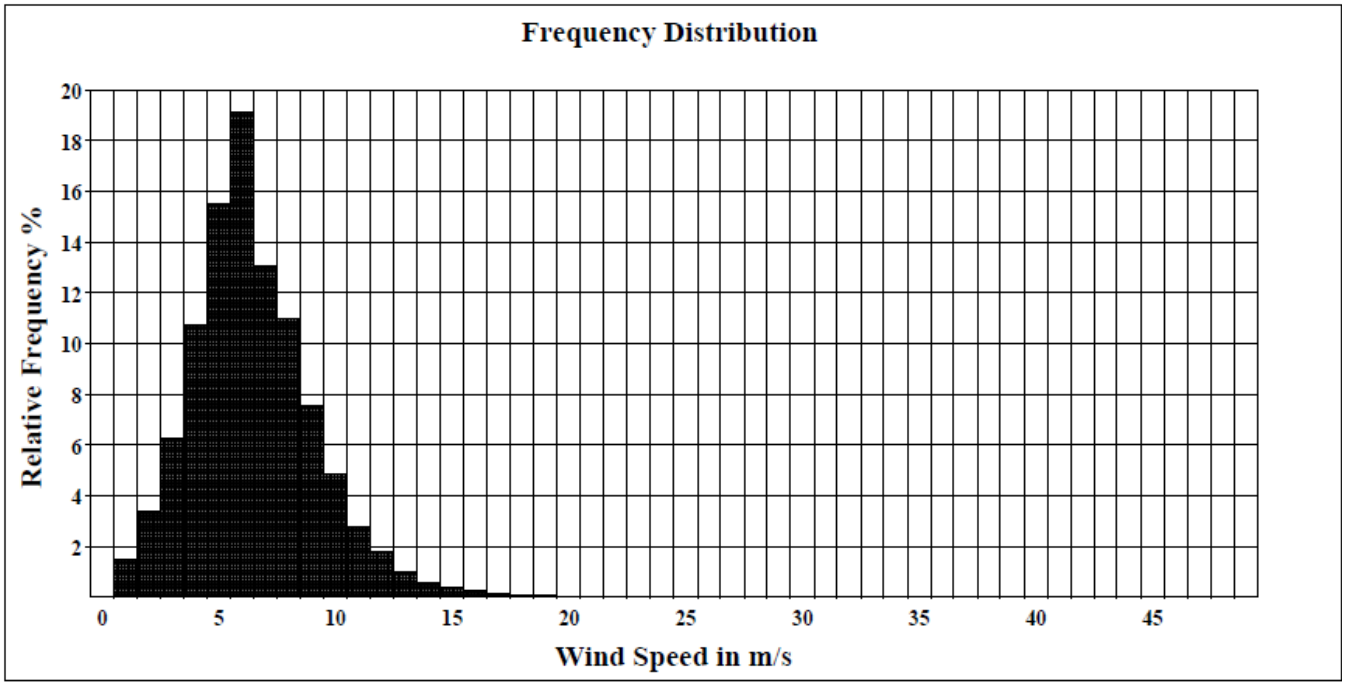
Frequency Distribution @ 50m for 2010



Frequency Distribution @ 40m for 2010



Frequency Distribution @ 30m for 2010



4 Hourly Average Wind Speed

Hourly Average Wind Speed 2010 (m/s)

Hour	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV*	DEC*
00:00 - 1:00	8.50	6.40	8.20	8.40	8.40	8.20	6.20	6.60	7.30	N/A	7.90	8.00
1:00 - 2:00	8.90	6.90	8.30	8.30	7.60	8.00	5.80	6.60	7.30	N/A	8.00	8.10
2:00 - 3:00	8.40	6.70	8.50	8.00	7.30	7.40	5.70	6.50	6.80	N/A	7.70	8.40
3:00 - 4:00	8.50	6.60	8.40	7.80	7.30	7.10	5.80	6.50	6.80	N/A	7.70	8.40
4:00 - 5:00	8.20	6.50	8.40	7.70	7.60	6.80	5.60	6.20	7.00	N/A	7.70	8.20
5:00 - 6:00	8.10	6.70	8.80	7.90	7.40	6.50	5.50	5.80	6.90	N/A	7.60	7.90
6:00 - 7:00	7.90	6.60	8.70	7.70	7.60	6.40	5.50	5.10	6.50	N/A	7.50	8.20
7:00 - 8:00	7.30	6.40	8.30	8.20	8.10	6.30	6.10	5.30	6.40	N/A	6.80	7.90
8:00 - 9:00	6.40	6.20	8.60	9.10	8.10	5.90	6.00	5.60	6.50	N/A	7.00	7.80
9:00 - 10:00	6.70	6.00	8.50	9.50	8.00	5.60	5.90	5.80	6.00	N/A	7.70	8.60
10:00 - 11:00	7.60	5.80	8.70	9.60	8.10	5.50	6.00	5.80	5.50	N/A	8.10	9.00
11:00 - 12:00	7.90	6.00	9.00	9.80	8.30	5.50	6.20	5.60	5.60	N/A	8.30	9.40
12:00 - 13:00	8.00	5.90	9.10	10.10	8.40	5.80	6.20	5.50	5.70	N/A	8.40	9.30
13:00 - 14:00	8.20	5.70	9.30	10.80	8.60	6.30	6.60	5.60	6.10	N/A	8.70	9.50
14:00 - 15:00	7.90	5.70	9.50	10.60	9.10	6.60	6.90	6.00	6.30	N/A	8.80	9.30
15:00 - 16:00	7.60	6.10	9.80	10.90	8.90	7.40	7.70	6.90	6.40	N/A	8.10	8.70
16:00 - 17:00	7.80	6.10	9.20	10.90	9.40	8.40	7.60	7.20	6.90	N/A	7.10	7.50
17:00 - 18:00	8.00	6.20	8.40	10.00	9.20	8.50	7.80	7.00	7.50	N/A	7.30	7.70
18:00 - 19:00	8.60	6.40	8.20	9.20	8.70	9.20	7.50	7.10	7.80	N/A	7.40	7.80
19:00 - 20:00	8.90	6.20	8.40	8.70	8.90	9.10	7.30	7.60	8.00	N/A	7.50	7.90
20:00 - 21:00	8.70	5.90	8.30	8.50	9.30	9.10	7.20	7.50	7.90	N/A	7.60	7.60
21:00 - 22:00	8.80	6.10	8.30	8.60	9.10	8.80	7.00	6.80	7.60	N/A	7.50	7.60
22:00 - 23:00	8.60	5.90	7.90	8.60	8.60	8.60	6.80	6.60	7.50	N/A	7.50	7.40
23:00 - 24:00	8.50	5.90	7.80	8.70	8.40	8.20	6.70	6.60	7.40	N/A	7.40	7.80
Average	8.10	6.20	8.60	9.10	8.40	7.30	6.50	6.30	6.80	N/A	7.70	8.20

(*) For these months figures correspond to the 40-m height.

Hourly Average Wind Speed 2010 (mph)

Hour	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV*	DEC*
00:00 - 1:00	19.01	14.32	18.34	18.79	18.79	18.34	13.87	14.76	16.33	N/A	17.67	17.90
1:00 - 2:00	19.91	15.43	18.57	18.57	17.00	17.90	12.97	14.76	16.33	N/A	17.90	18.12
2:00 - 3:00	18.79	14.99	19.01	17.90	16.33	16.55	12.75	14.54	15.21	N/A	17.22	18.79
3:00 - 4:00	19.01	14.76	18.79	17.45	16.33	15.88	12.97	14.54	15.21	N/A	17.22	18.79
4:00 - 5:00	18.34	14.54	18.79	17.22	17.00	15.21	12.53	13.87	15.66	N/A	17.22	18.34
5:00 - 6:00	18.12	14.99	19.69	17.67	16.55	14.54	12.30	12.97	15.43	N/A	17.00	17.67
6:00 - 7:00	17.67	14.76	19.46	17.22	17.00	14.32	12.30	11.41	14.54	N/A	16.78	18.34
7:00 - 8:00	16.33	14.32	18.57	18.34	18.12	14.09	13.65	11.86	14.32	N/A	15.21	17.67
8:00 - 9:00	14.32	13.87	19.24	20.36	18.12	13.20	13.42	12.53	14.54	N/A	15.66	17.45
9:00 - 10:00	14.99	13.42	19.01	21.25	17.90	12.53	13.20	12.97	13.42	N/A	17.22	19.24
10:00 - 11:00	17.00	12.97	19.46	21.47	18.12	12.30	13.42	12.97	12.30	N/A	18.12	20.13
11:00 - 12:00	17.67	13.42	20.13	21.92	18.57	12.30	13.87	12.53	12.53	N/A	18.57	21.03
12:00 - 13:00	17.90	13.20	20.36	22.59	18.79	12.97	13.87	12.30	12.75	N/A	18.79	20.80
13:00 - 14:00	18.34	12.75	20.80	24.16	19.24	14.09	14.76	12.53	13.65	N/A	19.46	21.25
14:00 - 15:00	17.67	12.75	21.25	23.71	20.36	14.76	15.43	13.42	14.09	N/A	19.69	20.80
15:00 - 16:00	17.00	13.65	21.92	24.38	19.91	16.55	17.22	15.43	14.32	N/A	18.12	19.46
16:00 - 17:00	17.45	13.65	20.58	24.38	21.03	18.79	17.00	16.11	15.43	N/A	15.88	16.78
17:00 - 18:00	17.90	13.87	18.79	22.37	20.58	19.01	17.45	15.66	16.78	N/A	16.33	17.22
18:00 - 19:00	19.24	14.32	18.34	20.58	19.46	20.58	16.78	15.88	17.45	N/A	16.55	17.45
19:00 - 20:00	19.91	13.87	18.79	19.46	19.91	20.36	16.33	17.00	17.90	N/A	16.78	17.67
20:00 - 21:00	19.46	13.20	18.57	19.01	20.80	20.36	16.11	16.78	17.67	N/A	17.00	17.00
21:00 - 22:00	19.69	13.65	18.57	19.24	20.36	19.69	15.66	15.21	17.00	N/A	16.78	17.00
22:00 - 23:00	19.24	13.20	17.67	19.24	19.24	19.24	15.21	14.76	16.78	N/A	16.78	16.55
23:00 - 24:00	19.01	13.20	17.45	19.46	18.79	18.34	14.99	14.76	16.55	N/A	16.55	17.45
Average	18.12	13.87	19.24	20.36	18.79	16.33	14.54	14.09	15.21	N/A	17.22	18.34

(*) For these months figures correspond to the 40-m height.

5 Average Speed: Day vs. Night

Average Speed: Day vs. Night 2010

		50 m	40 m	30 m
January	Night	7.37	4.55	7.27
	Day	6.80	4.69	7.25
	2%	8%	-3%	0%
February	Night	7.33	6.73	6.52
	Day	7.54	7.35	7.27
	-8%	-3%	-9%	-12%
March	Night	11.17	11.10	10.58
	Day	9.58	9.05	8.25
	18%	14%	18%	22%
April	Night	7.94	7.38	6.74
	Day	9.41	9.17	8.72
	-24%	-18%	-24%	-29%
May	Night	9.67	9.08	8.35
	Day	11.31	11.22	10.88
	-24%	-17%	-24%	-30%
June	Night	9.30	8.80	8.19
	Day	9.04	9.01	8.79
	-2%	3%	-2%	-7%
July	Night	7.61	7.12	6.62
	Day	8.87	8.77	8.61
	-23%	-17%	-23%	-30%
August	Night	7.75	7.17	6.46
	Day	8.20	8.12	7.85
	-14%	-6%	-13%	-21%
September	Night	8.31	7.81	7.04
	Day	8.33	8.27	7.93
	-6%	0%	-6%	-13%
October	Night	N/A	N/A	N/A
	Day	N/A	N/A	N/A
	N/A	N/A	N/A	N/A
November	Night	N/A	7.93	7.20
	Day	N/A	9.26	8.81
	-20%	N/A	-17%	-22%
December	Night	N/A	9.08	8.18
	Day	N/A	10.74	10.16
	-21%	N/A	-18%	-24%
Annual Average	-11%			

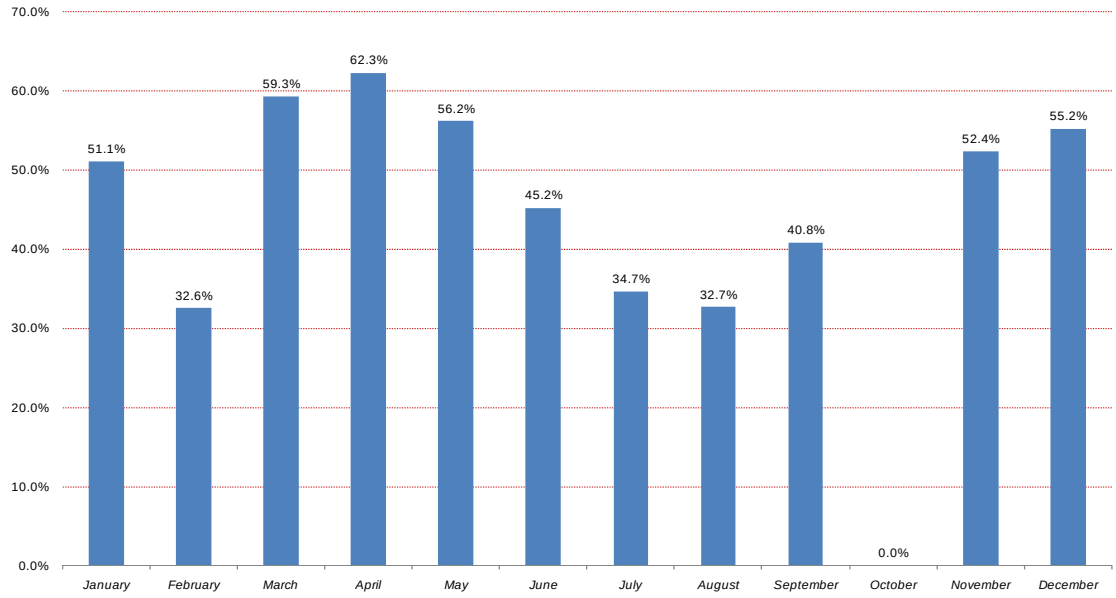
6 Energy Yield and Capacity Factor for 2010

This estimation was performed considering the approximated power curve for the GE 1.5 MW Wind Turbine @ 65 m hub height[2]. These results are using estimates, thus should not be considered as a feasibility analysis nor be intended as a wind farm development analysis.

Monthly Energy Yield and Capacity Factor for 2010

Month	*Capacity Factor %*	*Yield Energy MWh*
January	*51.1%*	*570.68*
February	*32.6%*	*328.25*
March	*59.3%*	*661.68*
April	*62.3%*	*672.58*
May	*56.2%*	*626.93*
June	*45.2%*	*464.00*
July	*34.7%*	*386.81*
August	*32.7%*	*364.91*
September	*40.8%*	*440.93*
October	*N/A*	*N/A*
November	*52.4%*	*566.03*
December	*55.2%*	*615.96*
Average/Total	*47.5%*	*5,698.74*

Monthly Capacity Factor for 2010 (Graph)



[2] The wind speed values at 65 m were calculated using the actual wind shear approximation data from 30 to 50 from this site.

7 Maximum Gust

The maximum wind speeds at the 50 meters level are an indication of the possible high wind speeds that could bring the turbines to stop; depending on their design, wind turbines have different cut-out-out wind speed, that is the highest at which a wind turbine stops producing power.

Maximum Gust at 50 m level 2010

Month	*m/s*	*mph*
January	*28.70*	*64.20*
February	*19.50*	*43.62*
March	*27.90*	*62.41*
April	*32.40*	*72.48*
May	*31.80*	*71.13*
June	*29.10*	*65.09*
July	*18.70*	*41.83*
August	*24.40*	*54.58*
September	*26.00*	*58.16*
October	*N/A*	*N/A*
*November **	*24.00*	*53.69*
*December **	*32.40*	*72.48*
Average	*24.66*	*55.16*

(*) For these months figures correspond to the 40-m height.

8 Wind Shear Exponent

The wind shear exponent represents the degree to which wind speed increases with height. The wind shear exponent was calculated for the 30 to 50-m height. During wind energy farm development, this parameter is used to determining an appropriate wind turbine hub height, and should be determined for each site, since its value depends on the specific characteristics of the site.

Wind Shear Exponent 2010

Month	*30 - 50 m Shear*
January	*0.24*
February	*0.17*
March	*0.24*
April	*0.23*
May	*0.25*
June	*0.23*
July	*0.23*
August	*0.31*
September	*0.30*
October	*N/A*
*November **	*0.32*
*December **	*0.32*
Average	*0.24*

(*) For these months the wind share exponent was calculated for the 30 to 40-m height

9 Turbulence Intensity

Wind turbulence is the rapid disturbances or irregularities in the wind speed, direction, and vertical component, and it is a relative indicator of turbulence with low levels indicated by values less than or equal to 0.10, moderate levels from 0.11 to 0.25, and high levels greater than 0.25. It is an important site characteristic, because high turbulence levels may decrease power output and cause extreme loading on wind turbine components.

Turbulence Intensity Monthly Average for 2010 @ 50 m

Wind Direction (º)	*JAN*	*FEB*	*MAR*	*APR*	*MAY*	*JUN*	*JUL*	*AUG*	*SEP*	*OCT*	*NOV*	*DEC*	*Directional Average*
0 (N)	*0.07*	*0.09*	*0.11*	*0.12*	*0.15*	*0.12*	*0.15*	*0.12*	*0.10*	*N/A*	*N/A*	*N/A*	*0.07*
22.5	*0.09*	*0.10*	*0.09*	*0.09*	*0.09*	*0.12*	*0.12*	*0.11*	*0.12*	*N/A*	*N/A*	*N/A*	*0.09*
45	*0.08*	*0.10*	*0.00*	*0.10*	*0.14*	*0.13*	*0.12*	*0.12*	*0.10*	*N/A*	*N/A*	*N/A*	*0.08*
67.5	*0.08*	*0.10*	*0.07*	*0.10*	*0.11*	*0.16*	*0.12*	*0.12*	*0.16*	*N/A*	*N/A*	*N/A*	*0.08*
90 (E)	*0.07*	*0.08*	*0.08*	*0.10*	*0.12*	*0.12*	*0.11*	*0.11*	*0.13*	*N/A*	*N/A*	*N/A*	*0.07*
112.5	*0.07*	*0.08*	*0.08*	*0.10*	*0.11*	*0.11*	*0.11*	*0.09*	*0.09*	*N/A*	*N/A*	*N/A*	*0.07*
135	*0.07*	*0.09*	*0.09*	*0.08*	*0.11*	*0.11*	*0.12*	*0.09*	*0.10*	*N/A*	*N/A*	*N/A*	*0.07*
157.5	*0.08*	*0.08*	*0.09*	*0.09*	*0.11*	*0.11*	*0.11*	*0.08*	*0.09*	*N/A*	*N/A*	*N/A*	*0.08*
180 (S)	*0.07*	*0.08*	*0.08*	*0.09*	*0.10*	*0.10*	*0.10*	*0.10*	*0.09*	*N/A*	*N/A*	*N/A*	*0.07*
202.5	*0.06*	*0.07*	*0.09*	*0.11*	*0.10*	*0.13*	*0.11*	*0.12*	*0.10*	*N/A*	*N/A*	*N/A*	*0.06*
225	*0.07*	*0.07*	*0.09*	*0.10*	*0.10*	*0.12*	*0.08*	*0.09*	*0.10*	*N/A*	*N/A*	*N/A*	*0.07*
247.5	*0.05*	*0.06*	*0.07*	*0.09*	*0.11*	*0.14*	*0.09*	*0.07*	*0.09*	*N/A*	*N/A*	*N/A*	*0.05*
270 (W)	*0.05*	*0.04*	*0.05*	*0.06*	*0.08*	*0.14*	*0.12*	*0.09*	*0.11*	*N/A*	*N/A*	*N/A*	*0.05*
292.5	*0.08*	*0.09*	*0.13*	*0.07*	*0.09*	*0.09*	*0.15*	*0.12*	*0.10*	*N/A*	*N/A*	*N/A*	*0.08*
315	*0.06*	*0.08*	*0.20*	*0.15*	*0.11*	*0.11*	*0.11*	*0.14*	*0.07*	*N/A*	*N/A*	*N/A*	*0.06*
337.5	*0.07*	*0.11*	*0.14*	*0.14*	*0.11*	*0.11*	*0.17*	*0.11*	*0.07*	*N/A*	*N/A*	*N/A*	*0.07*
Monthly Average	*0.07*	*0.08*	*0.09*	*0.10*	*0.11*	*0.12*	*0.12*	*0.11*	*0.10*	*N/A*	*N/A*	*N/A*	*0.10*

Turbulence Intensity Monthly Average for 2010 @ 40 m

Wind Direction (º)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Directional Average
0 (N)	0.07	0.13	0.14	0.14	0.12	0.12	0.16	0.14	0.12	N/A	0.12	0.13	0.13
22.5	0.10	0.10	0.11	0.11	0.11	0.14	0.14	0.13	0.13	N/A	0.11	0.10	0.12
45	0.08	0.10	0.10	0.10	0.13	0.14	0.13	0.13	0.11	N/A	0.07	0.09	0.11
67.5	0.07	0.11	0.10	0.10	0.11	0.16	0.12	0.14	0.16	N/A	0.04	0.10	0.11
90 (E)	0.10	0.11	0.11	0.11	0.12	0.15	0.12	0.11	0.13	N/A	0.07	0.08	0.11
112.5	0.60	0.09	0.09	0.12	0.12	0.12	0.12	0.10	0.11	N/A	0.06	0.09	0.15
135	0.80	0.09	0.08	0.11	0.12	0.12	0.13	0.11	0.11	N/A	0.07	0.09	0.17
157.5	0.80	0.08	0.10	0.10	0.12	0.12	0.12	0.09	0.07	N/A	0.10	0.08	0.16
180 (S)	0.70	0.09	0.09	0.10	0.13	0.11	0.11	0.10	0.09	N/A	0.08	0.08	0.15
202.5	0.70	0.08	0.08	0.10	0.11	0.11	0.10	0.12	0.10	N/A	0.08	0.09	0.15
225	0.70	0.08	0.08	0.10	0.11	0.13	0.08	0.09	0.10	N/A	0.08	0.07	0.15
247.5	0.80	0.08	0.09	0.11	0.10	0.15	0.08	0.08	0.10	N/A	0.07	0.08	0.16
270 (W)	0.70	0.08	0.08	0.10	0.11	0.15	0.12	0.08	0.11	N/A	0.08	0.07	0.15
292.5	0.80	0.07	0.12	0.09	0.10	0.12	0.19	0.13	0.10	N/A	0.06	0.07	0.17
315	0.90	0.07	0.15	0.08	0.10	0.11	0.18	0.14	0.07	N/A	0.06	0.06	0.17
337.5	0.90	0.11	0.15	0.12	0.10	0.12	0.16	0.12	0.07	N/A	0.08	0.09	0.18
Monthly Average	0.55	0.09	0.10	0.11	0.11	0.13	0.13	0.11	0.11	N/A	0.08	0.09	0.15

10 Temperature

Air temperature is an important parameter of how a wind energy farm can perform and is normally measured either near ground level or near hub height. In most locations the average near ground level air temperature will be within 1°C of the average at hub height. It is also used to calculate air density, a variable required to estimate the wind power density and the power output of a wind turbine. Therefore; average, minimum and maximum temperature data is gathered and reported in the following tables.

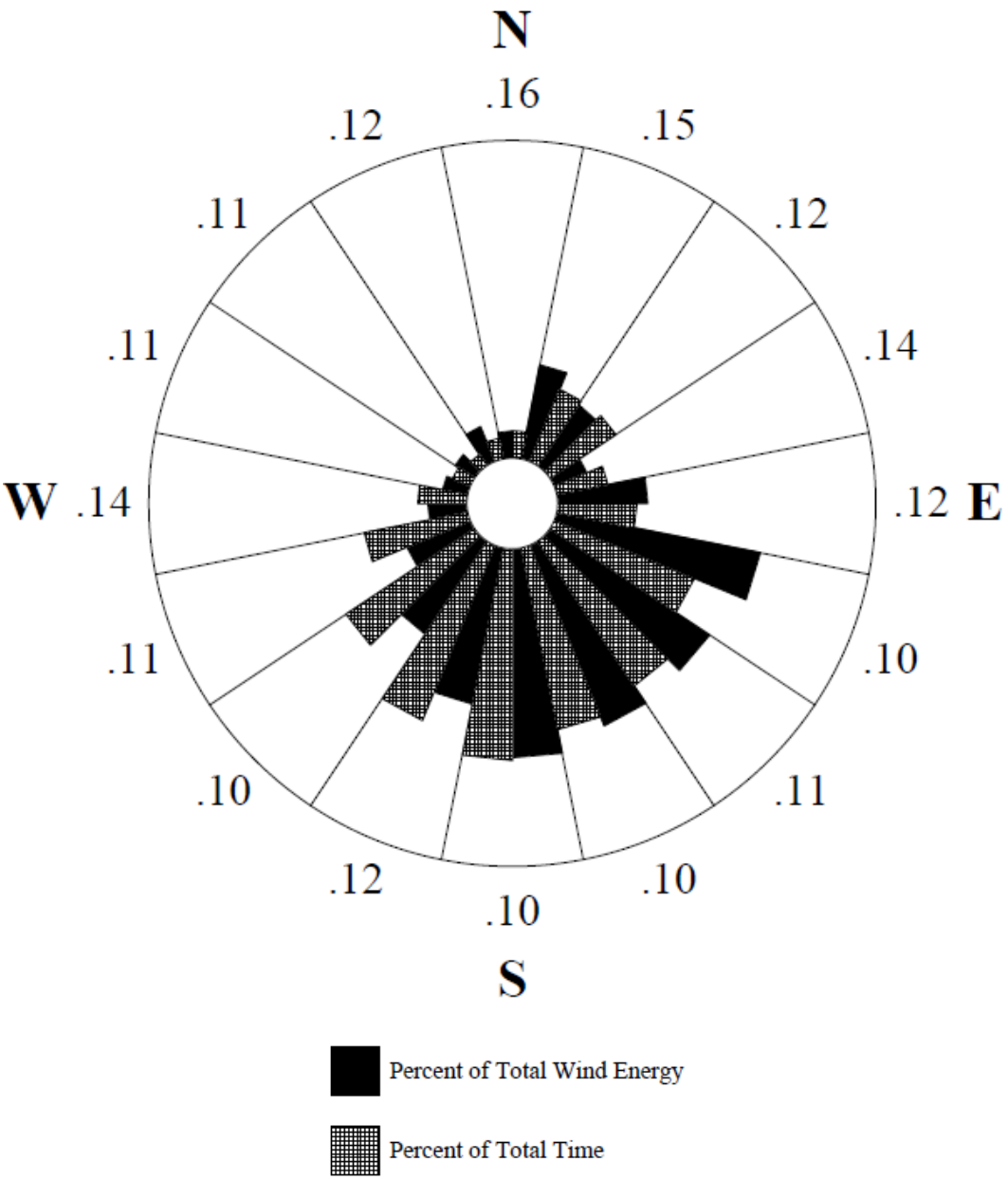
Temperature Ranges 2010

Month	Average		Minimum		Maximum	
	Celsius	Fahrenheit	Celsius	Fahrenheit	Celsius	Fahrenheit
January	2.22	36.0	-12	10.4	19	66.2
February	1.72	35.1	-10.3	13.5	18.4	65.1
March	8.39	47.1	-5.5	22.1	29.1	84.4
April	13.62	56.5	-3.3	26.1	29.6	85.3
May	18.16	64.7	2.6	36.7	34.1	93.4
June	25.56	78.0	13.2	55.8	38.2	100.8
July	24.24	75.6	16.2	61.2	38.4	101.1
August	24.56	76.2	9.2	48.6	36.9	98.4
September	22.33	72.2	10.3	50.5	35.6	96.1
October	N/A	N/A	N/A	N/A	N/A	N/A
November	7.38	45.3	-9.3	15.3	25.5	77.9
December	5.54	42.0	-10.1	13.8	25	77.0
Average	14.0	57.2	1.0	33.9	30.2	84.7

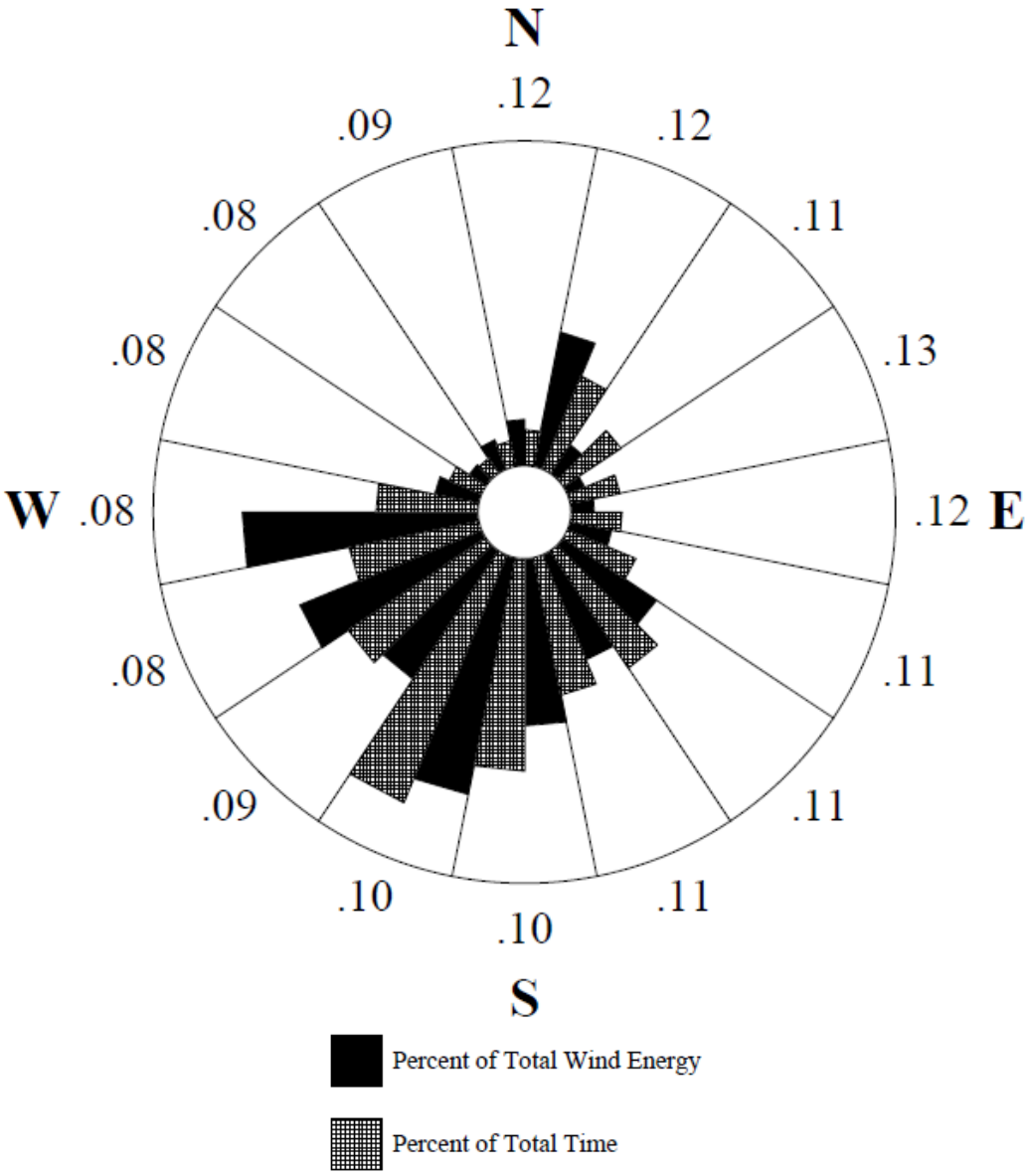
11 Wind Direction

The wind direction information is important and a useful tool for siting wind turbines. It is important to know the distributions and the frequency of the varying wind directions. The different spots pie shaped wedges show what percentage of time the wind blows from that direction or the relative frequency of each one of the sixteen wind directions. The black wedges indicate the energy available at the wind blowing from that direction, and the shaded ones the percent of total time that the wind blows from such direction.

Wind Direction at 50 m 2010



Wind Direction at 40 m 2010



12 Data Recovery

Recovery rates for wind speed data are calculated at all heights. The "Recovery Rate" represents the remaining data expressed as a percentage of total sensor hours in the period. The purpose of installing redundant sensors at the highest level is to ensure that even in the event of a sensor failure, data are still being collected.

Data Recovery Rates 2010

	Total Hours in period	Monthly Recovery Rate			Recovery Rate All Heights	Upper Level
		50 m	40 m	30 m		
January	*744*	*77%*	*92%*	*92%*	*84.6%*	*77.3%*
February	*672*	*50%*	*96%*	*96%*	*73.3%*	*50.4%*
March	*744*	*50%*	*100%*	*100%*	*75.0%*	*50.0%*
April	*720*	*50%*	*100%*	*100%*	*75.0%*	*50.0%*
May	*744*	*50%*	*100%*	*100%*	*75.0%*	*50.0%*
June	*720*	*48%*	*95%*	*95%*	*71.3%*	*47.5%*
July	*744*	*50%*	*100%*	*100%*	*75.0%*	*50.0%*
August	*744*	*50%*	*100%*	*100%*	*75.0%*	*50.0%*
September	*720*	*50%*	*100%*	*100%*	*75.0%*	*50.0%*
October	*744*	*1%*	*1%*	*1%*	*0.9%*	*0.6%*
November	*720*	*0%*	*96%*	*96%*	*47.8%*	*0.0%*
December	*744*	*0%*	*100%*	*100%*	*50.0%*	*0.0%*
Average		*36.1*	*90%*	*90%*	*64.8%*	*39.6%*

13 Standard Deviation

According to the "Wind Resource Assessment Handbook" (NREL, 1997), the standard deviation is defined as the true population standard deviation for all one or two second samples within each averaging interval. The standard deviations of wind speed and wind direction are indicators of turbulence level and atmospheric stability. It is also useful in detecting suspect or erroneous data when validating average values.

Average Internal Standard Deviation for 2010

	50 m	40 m	30 m
January	*0.6*	*0.63*	*0.64*
February	*0.57*	*0.59*	*0.62*
March	*0.78*	*0.82*	*0.82*
April	*0.9*	*0.93*	*0.94*
May	*0.9*	*0.93*	*0.94*
June	*0.88*	*0.89*	*0.92*
July	*0.73*	*0.74*	*0.77*
August	*0.69*	*0.7*	*0.72*
September	*0.74*	*0.75*	*0.76*
October	*N/A*	*N/A*	*N/A*
November	*N/A*	*0.67*	*0.67*
December	*N/A*	*0.7*	*0.68*
Average	*0.75*	*0.76*	*0.77*