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Some Variability Statistics of Available Wind Power

Jack W. Reed

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SOME VARIABILITY STATISTICS OF AVAILABLE WIND POWER

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ABSTRACT

The long-term variability of available wind power has been studied in ten-year records of hourly wind speed observations at fifteen selected weather stations. Month by month and year by year sums of wind power occurrences were used to generate average, standard deviation, and autocorrelation statistics. The amplitude of the annual cycle in available wind power was at least 70% of the average at all locations. Long term integrated power production showed maxima and minima that differed by 36 - 91% from average annual production.

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SOME VARIABILITY STATISTICS OF AVAILABLE WIND POWER

INTRODUCTION

A serious constraint against widespread exploitation of wind power is caused by its unreliability, resulting from natural variability of wind circulations. Effects of this variability are amplified by the cubic relationship between available wind power and wind speed. Even when application can be adapted to short term variations in wind speed, even on time scales of days, there are long-term random variations that affect the economics of wind power.

In this report the long term wind power variations are assessed. Hourly weather observations from fifteen selected stations, for ten years of record, have been used to obtain averages of available wind power for each month and year. Various statistical representations have been evaluated in hopes of finding some simple generalizations or relationships, by regions or by seasons, but nothing of special significance has evolved. In result, a number of statistical summaries have been prepared to make clear that there are large and random uncertainties in wind power supplies.

Calculations were made for three heights above ground, 10 m, 20 m, and 50 m, by an extrapolation using the "One-Seventh Power Law." This recommended empiricism [1] says that wind speed is proportional to the one-seventh power of height above the ground, over level, flat terrain with a neutral stability (adiabatic), temperature-height lapse rate. It should be valid, particularly for powerful winds with strong mechanical mixing from ground surface friction turbulence. In consequence of this speed-height relationship, wind power increases with the three-seventh power of height. Variability, expressed as a percentage of the average, is therefore invariant with height. Variability tabulations were prepared for the 10 m "standard" anemometer height [2], and although power is increased at 20 m to 50 m levels, their proportional variabilities would be the same.

SOURCE DATA

Magnetic tape weather observation records were obtained from the National Oceanographic and Atmospheric Administration (NOAA), National Climatic Center (NCC), Asheville, NC, for the fifteen selected stations listed in Table I. Station selection was made considering regional climatic characteristics, data availability, and special wind turbine project interests [3].

A ten-year record of hourly observations was obtained for most of these stations, but there were data gaps for certain stations. The Nantucket Shoals, MA, station was only

TABLE I

Stations Selected for Detailed Wind Power Analyses

Station	Record Period Start	Record Period Stop	Anemometer Height (m)	Anemometer Height (ft)	Remarks	Station Selection Criteria
Corpus Christi, TX	1/1/55	12/31/60*	19.2	63	Atop control tower roof	Gulf coast winds
	1/1/61*	12/31/64	6.7	22	Near runway 13R-31L	
Albuquerque, NM	1/1/55	2/4/60	14.6	48	Atop airport adm. bldg.	Sandia VAWT Lab
	2/5/60	12/31/64	7.0	23	Near E-W runway	
Memphis, TN	1/1/55	7/22/58	16.8	55	Atop airport adm. bldg.	Southeast U.S., light winds
	7/23/58	12/31/64	6.7	22	(Near runway?)**	
Dodge City, KS	1/1/55	4/12/61	17.7	58	Atop airport adm. bldg.	High plains winds
	4/13/61	12/31/64	6.1	20	(Near runway?)**	
Nantucket Shoals, MA	4/1/57	12/4/62	61.0	200	Radio mast, top deck, Texas Tower	Atlantic offshore winds
Cleveland, OH	1/1/55	1/30/56	17.1	56	Atop mun. airport adm. bldg.	NASA Lewis Lab and turbine
	1/31/56	6/25/59	26.8	88	Atop int'l airport term. bldg.	
	6/26/59	12/31/64	6.1	20	(Near runway?)**	
Fargo, ND	1/1/55	6/26/61	26.2	86	Atop airport adm. bldg.	Northern plains winds
	6/27/61	12/31/64	6.1	20	(Near runway?)**	
Lubbock, TX	1/1/55	12/31/64	20.7	68	Atop airport term. bldg.	High plains winds, Texas Tech turbine project
Oklahoma City, OK	1/1/55	12/31/64	4.0	13	Near N-S runway	Plains winds, university turbine projects
Cheyenne, WY	1/1/55	10/2/57	22.3	73	Atop airport bldg.	Western high plains.
	10/3/57	12/31/64	10.1	33	(Near runway?)**	
Great Falls, MT	1/1/55	8/1/59	22.9	75	Atop airport adm. bldg.	Mountainous and windy
	8/2/59	12/31/64	7.0	23	(Near runway?)**	
Tatoosh Is., WA	1/1/55	12/31/64	19.5	64	Atop USWB office	Pacific coastal winds
Enewetak, Marshal Is.	1/1/60	6/30/69	----	Unkn	----	Tradewinds, ERDA site
San Nicolas Is., CA	1/1/60	6/30/63*	21.9	72	Atop control tower	Pacific coastal winds
	7/1/63*	12/31/69	4.0	13	800 ft SE of opns bldg.	
Cape Hatteras, NC	3/1/57	12/31/64	9.8	32	At USWB bldg. in Buxton	Atlantic coastal winds

*Exact date of anemometer relocation not recorded.

**Final location not specified but it probably was near a runway.

operated for 5 years. Enewetak observations were only made every three hours. At Cape Hatteras, NC, only three-hourly observations were made for the last 26 months of the ten-year record. At San Nicolas Island, CA, measurements were usually made only during the daytime. Other station records had, at most, fifteen missing observations (0.017% missing).

At nine of the fifteen stations there had been at least one change in anemometer exposure during the period of record [4]. The anemometer was situated at standard 10 m height for only one complete station record and part of another. An adjustment procedure was developed to produce homogenized time series of hourly wind speeds at the international standard height of 10 m [4]. These homogenized series were used to generate various time-dependent statistics.

MONTHLY WIND POWER AVAILABILITY

Each hourly wind speed observation was assumed to be representative of one hour of continuous wind record, although standard observing procedure is to average only a couple minutes of continuous recording or visual meter reading. Detailed observations have shown that this procedure is adequate for most climatological purposes. For wind power estimates (which use wind speeds cubed), it has been shown [5] that these hourly observations yield slightly conservative results, below the power as measured at two minute intervals.

Hourly wind power values (Wm^{-2}) were calculated from adjusted hourly wind speeds, and assumed to persist for one hour to give the available wind energy ($kWhr/m^2$ and GJ/m^2).* Hourly energy availability was summed for each month of the ten year series. The mathematical procedure was detailed in an earlier report [3]. Results, for one square meter perpendicular to the (horizontal) wind, are tabulated in the Appendix, along with annual summaries and appropriate statistical representations.

An example from the first listed station, Corpus Christi, TX, has been plotted in Figure 1, to show the roughly seasonal pattern of variation that is generally associated with the seasonal march of weather. The most wind energy usually came during stormy spring months [6], but relatively large or small amounts of wind energy could come in any season. There is a modest correlation coefficient (0.47) between successive months at Corpus Christi. Many other stations showed smaller autocorrelations (time-lag correlations) on this time scale, as shown in Table II.

*One kilowatt hour equals 3.6×10^6 joules, for SI metric units.

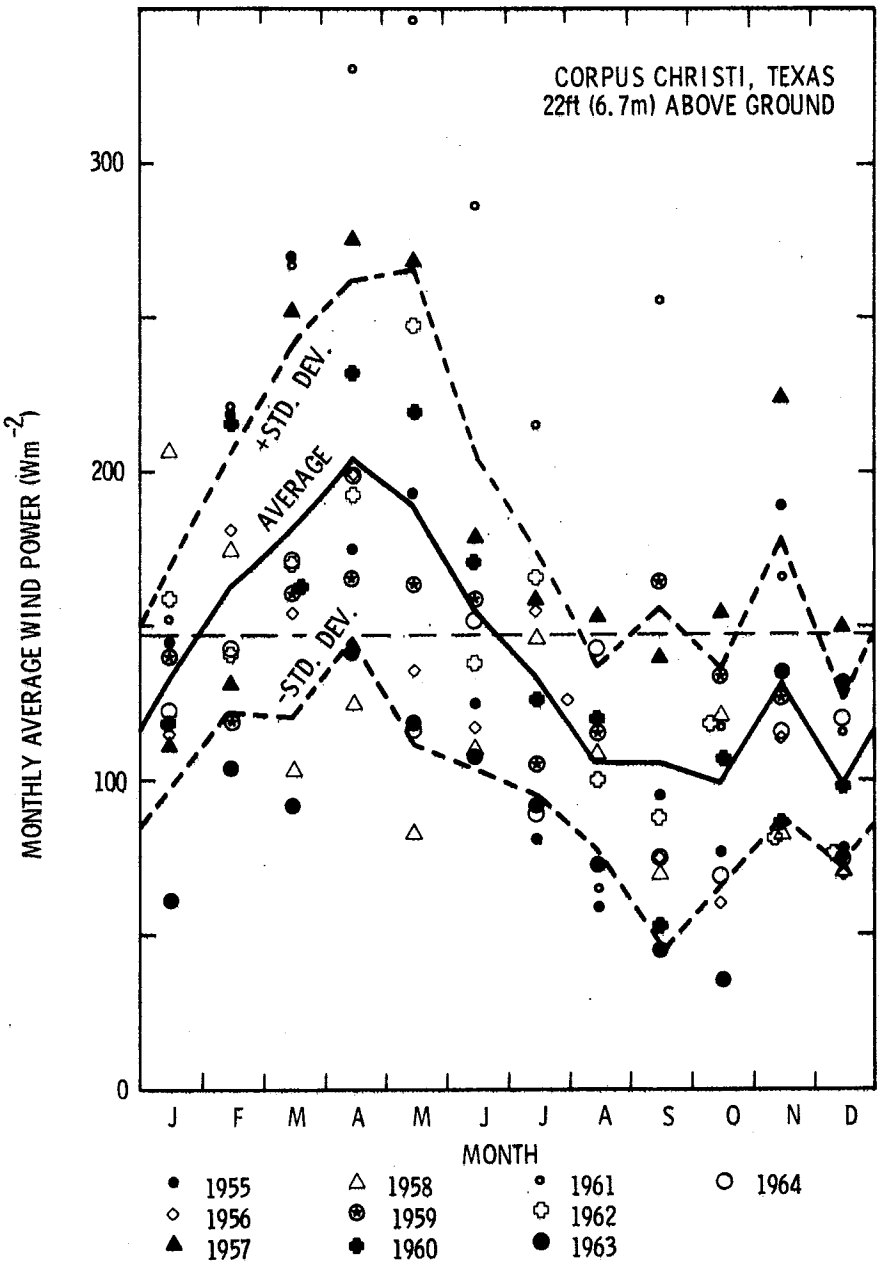

Figure 1. Monthly Average Available Wind Power, Ten years of Record at Corpus Christi, Texas.

TABLE II. Time-Lag Correlation Coefficients for Wind Power Averages for One Month and One Year Intervals.

Station	Monthly	Annual
Corpus Christi	0.47	-0.10
Albuquerque	0.24	-0.32
Memphis	0.38	0.24
Dodge City	0.36	0.00
Nantucket Shoals	0.06	0.21
Cleveland	0.25	0.32
Fargo	0.41	0.40
Lubbock	0.20	0.20
Oklahoma City	0.14	-0.25
Cheyenne	0.06	-0.07
Great Falls	0.31	0.39
Tatoosh Island	0.20	-0.28
Enewetak	0.41	0.25
San Nicholas Island	0.10	-0.50
Cape Hatteras	0.33	0.53

Both month-to-month and year-to-year time-lag correlation coefficients, R, are plotted in Figure 2. It appears that correlation is weak in the West and Pacific areas, and increases toward the east. The significance of even R = 0.5 is that 0.5 of the deviation from normal during one period can be expected to persist into the following time period [7]. The error in forecasting, however, would be $[1 - (0.5)^2]^{1/2}$, or 0.87 times the population standard deviation. Thus there is only a 13% improvement in prediction possible from consideration of this correlation coefficient by comparison to assuming that the average condition will occur.

There is a problem, in that the data base for several stations was disrupted by anemometer exposure changes [4]. The homogenization adjustment was made to alleviate the effects of these changes, but some residual disturbance may have persisted. Monthly production (average available wind energy) is shown in Figure 3, for Cleveland and Cheyenne. Both stations had anemometry moves during their periods of record. Cleveland data are somewhat more regular than Cheyenne data, a manifestation of the higher autocorrelation coefficient.

There is no clear indication of any data shift that was coincident with anemometer height changes. It thus appears that the adjustment procedure was effective. Other stations also showed no clear indication of shifts in energy estimates that coincided with anemometry changes.

In Figure 4 for Cape Hatteras with relatively high correlations, and Oklahoma City with weak correlations, respectively, the noise level appears to be more or less similar. There was no anemometer change at these two stations. Year to year dissimilarities are reasonably like those from Cleveland and Cheyenne, where the anemometer was changed but the record was homogenized.

ANNUAL SERIES

Annual averages of available wind energy for ten years are shown in Figures 5.01 - 5.15. There are large variations in production from year to year at all locations. A brief survey of these figures will confirm that there was no significant change in pattern associated with a change in anemometer exposure.

The credibility of the interannual correlation coefficients (in Table II) fails in a subjective test, by comparing Albuquerque and Fargo patterns (Figures 5.02 and 5.07, respectively). The difference in general appearances, from respective autocorrelations of -0.31 and +0.40, is certainly not overwhelming.

One might expect that eastern locations, which showed relatively higher time-lag correlations, ostensibly from better organized weather patterns than appear for the mountainous west, would also show some interstation correlation. Unfortunately,

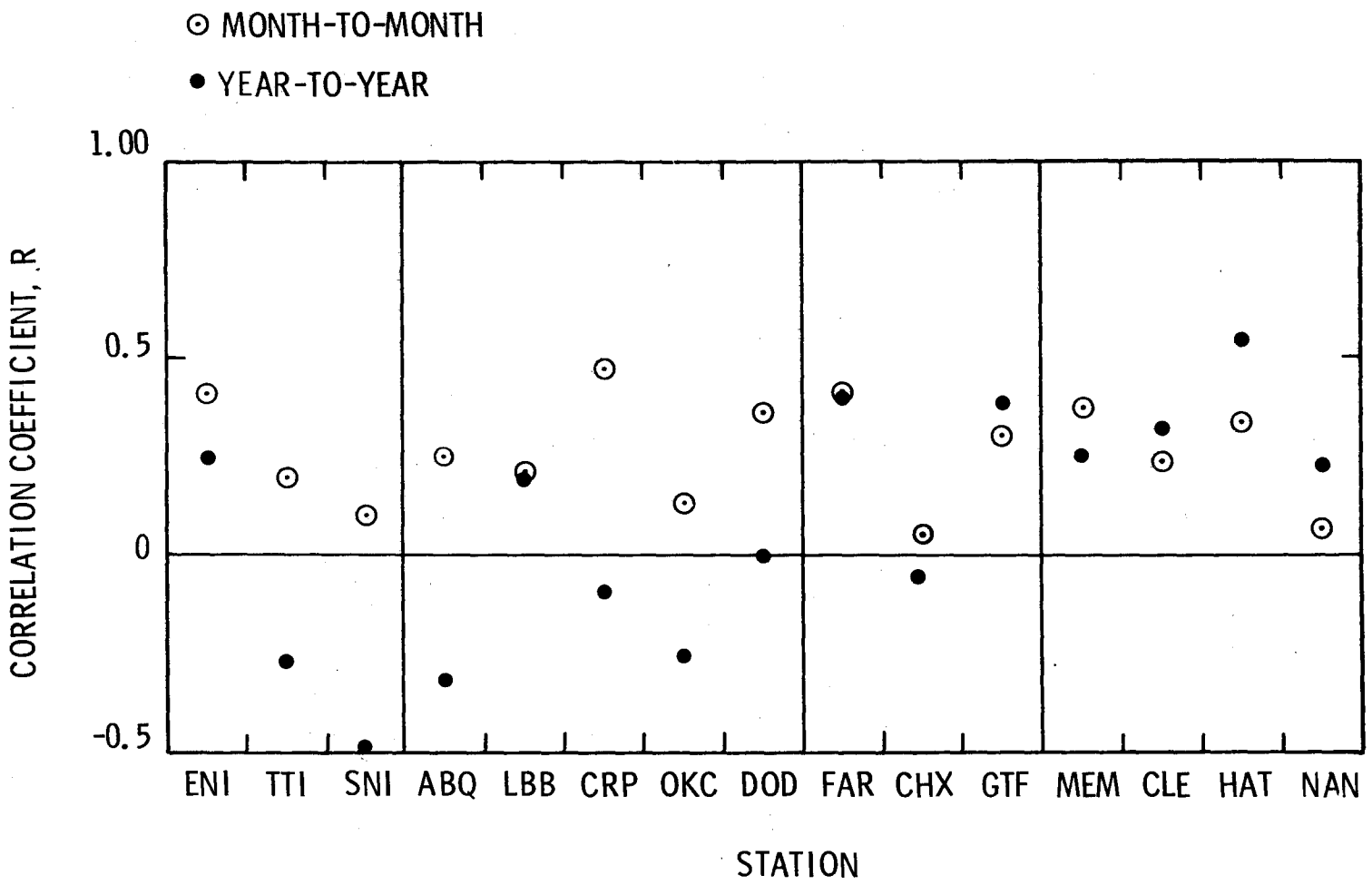

FIGURE 2. Time-lag Correlation Coefficients for Wind Power, Month-to-Month and Year-to-Year.

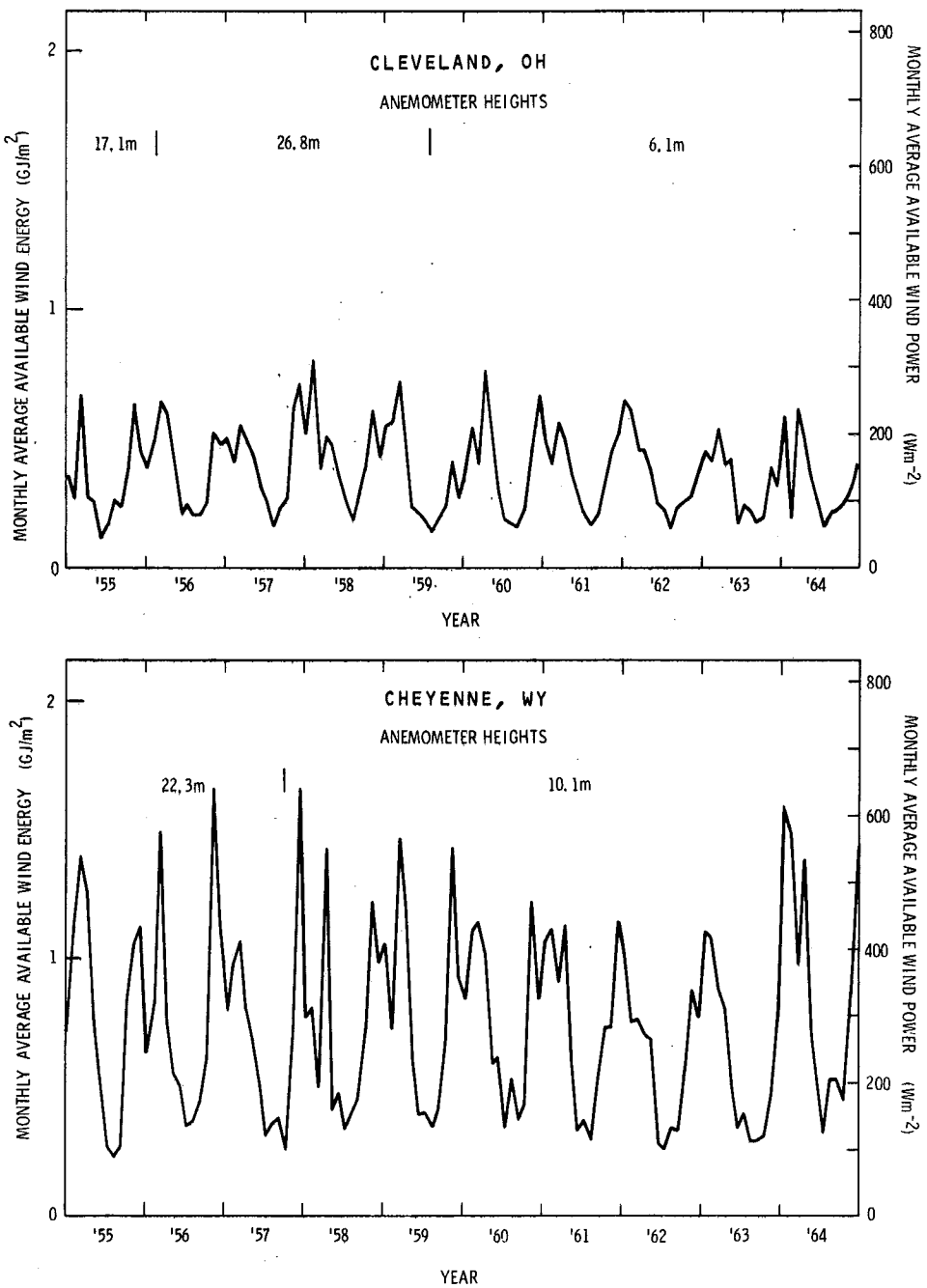

FIGURE 3. Time Series of Monthly Average Available Wind Power at Cleveland, OH, and Cheyenne, WY., at 10 m Height.

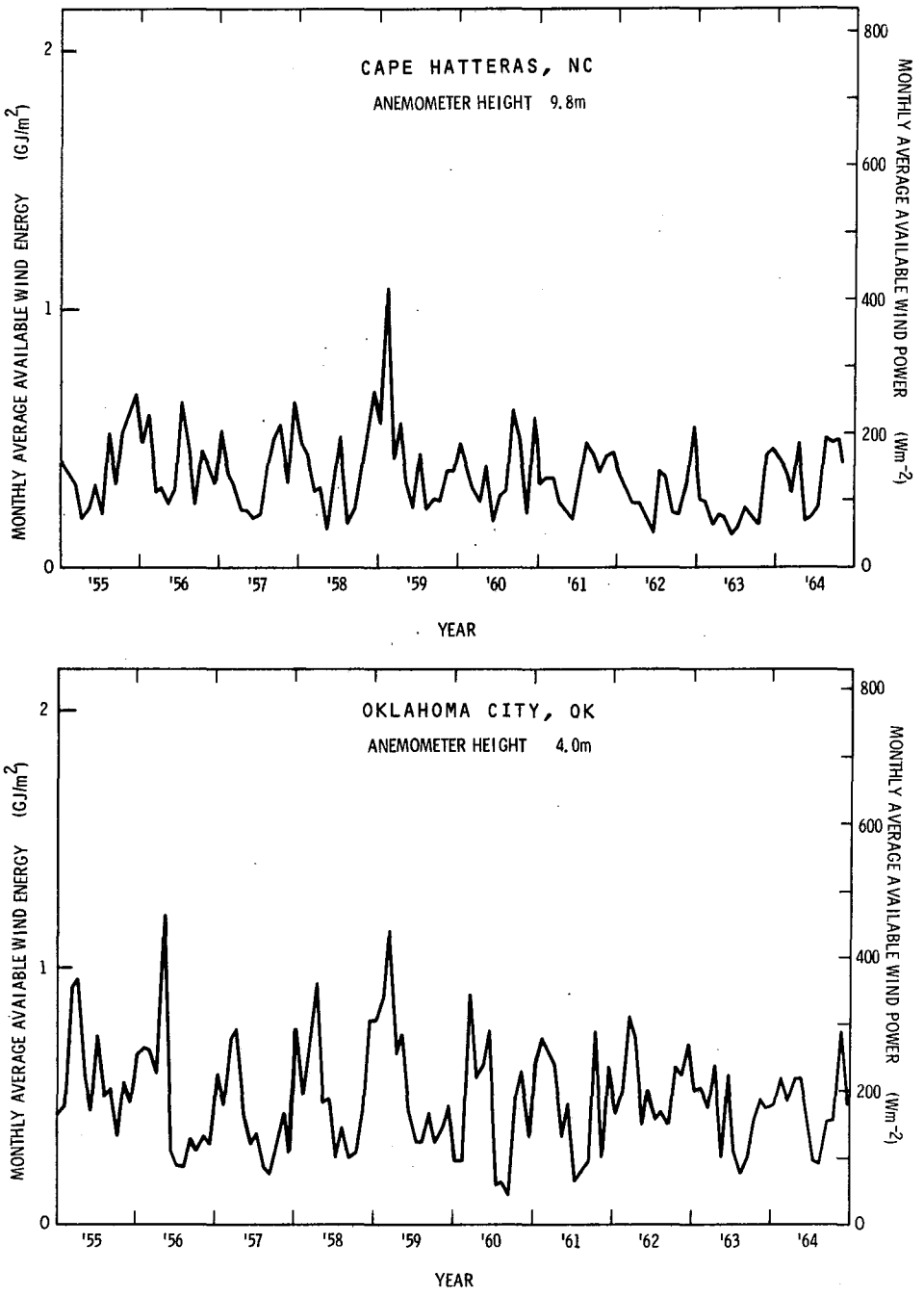

FIGURE 4. Time Series of Monthly Average Available Wind Power at Cape Hatteras, NC, and Oklahoma City, OK., at 10 m Height.

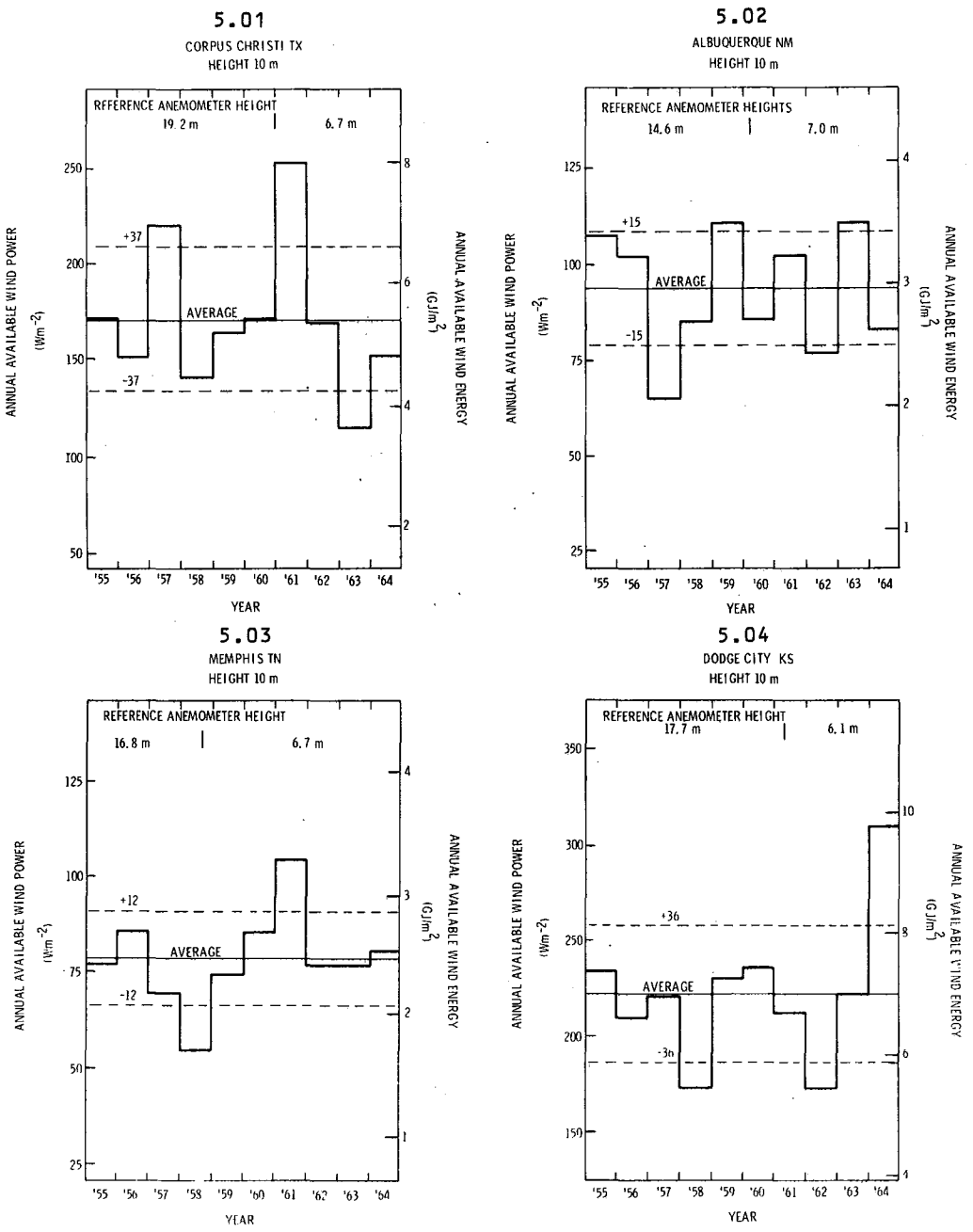

FIGURE 5. Annual Available Wind Power, Ten Year Records from Fifteen Stations.

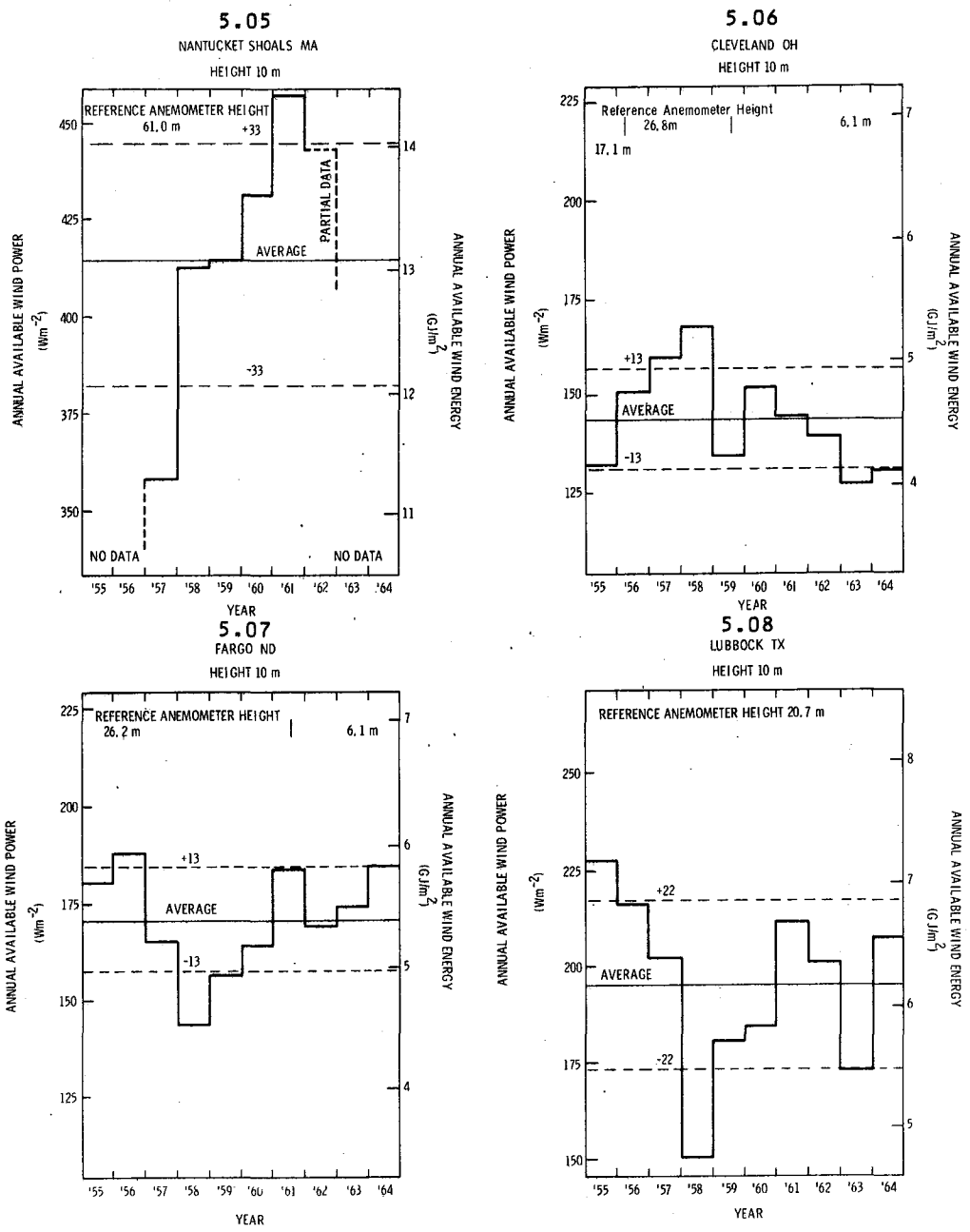

FIGURE 5 (Cont'd.) Annual Available Wind Power, Ten Year Records from Fifteen Stations.

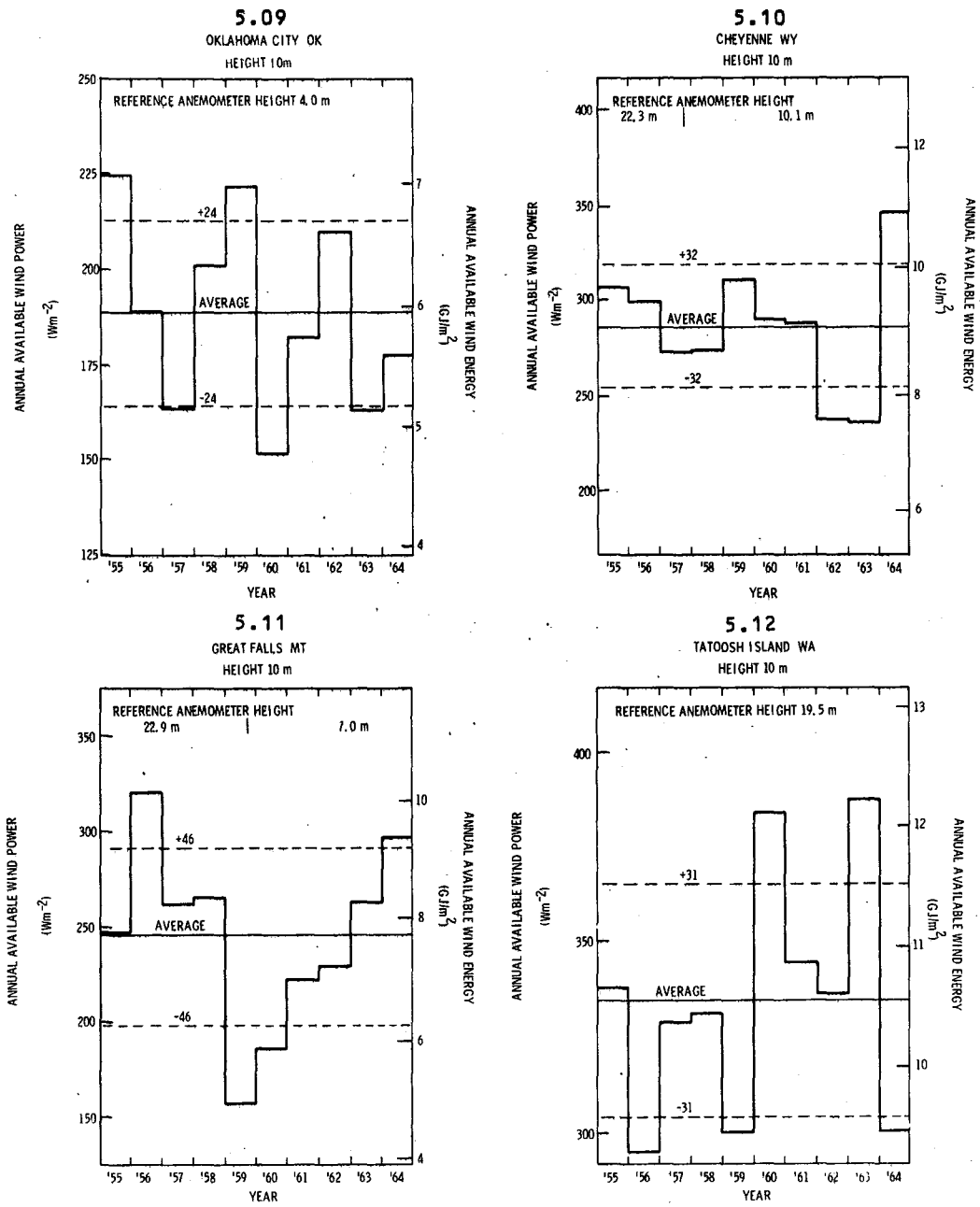

FIGURE 5 (Cont'd.) Annual Available Wind Power, Ten Year Records from Fifteen Stations.

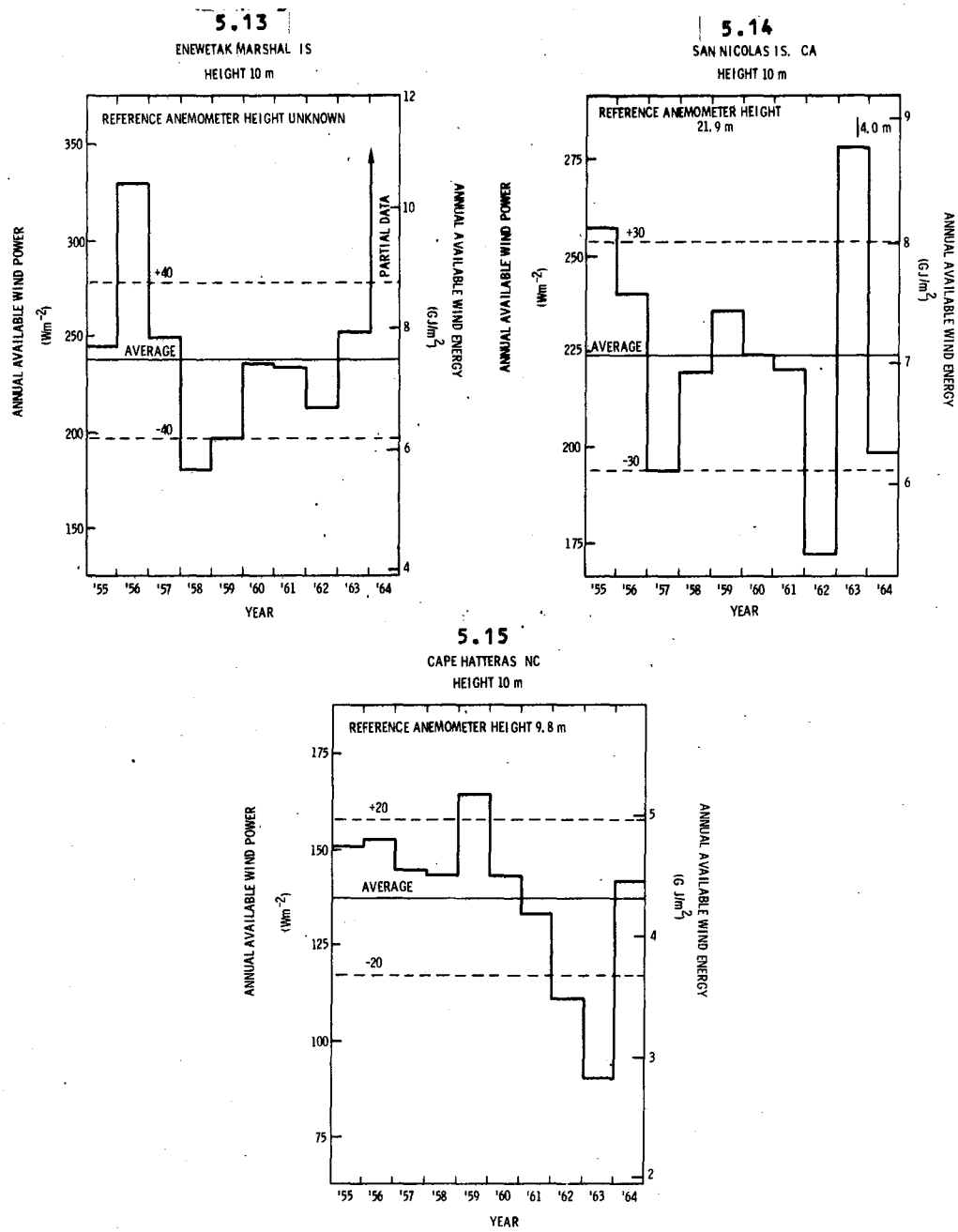

FIGURE 5 (Cont'd.) Annual Available Wind Power, Ten Year Records from Fifteen Stations.

the Nantucket Shoals record of only five years duration (Figure 5.05) was quite short. Comparison with Cleveland (Figure 5.06) does not indicate any significant connectedness. Memphis (Figure 5.03) and Cape Hatteras (Figure 5.15) also fail to show any obvious connectedness, between them or with the other two eastern stations. Dodge City, Lubbock, and Oklahoma City (Figures 5.04, 5.08, and 5.09) likewise show little similarity in their annual production characteristics, in in spite of their proximity.

STATISTICAL VARIABILITY

Neglecting the computed correlations, standard deviations were calculated for both monthly wind power and annual wind power availabilities. Results are shown in Figure 6. Annual standard deviations, shown by solid symbols, generally range from about 8% of station averages at Fargo and Nantucket Shoals, to to 22% at Corpus Christi (largely a result of occasional hurricanes [4]). In summary of the annual standard deviations, it appears that about ±15% variation in annual production should be expected at most locations. Even in the so-called steady tradewinds, at Enewetak, this variability and uncertainty is well demonstrated.

Monthly standard deviations from their respective monthly averages have been shown by open symbols in Figure 6. Only months with extreme values are shown for each station. At Enewetak, for example, December (month 12) is the least variable month, with ±21% standard deviation. In May (month 5) the standard deviation soars to ±61%. There is no clear seasonal pattern to these variability statistics, although there is some tendency toward smaller percent deviations in windier months.

Standard deviation data points from 9 stations were plotted in Figure 7 against monthly average wind power, to see if there was any discernable pattern. Data from the six stations that were omitted only contributed to the heavy cluster near coordinate (50,180). At individual stations with high monthly power averages, there is no constant or consistent pattern to the variety of standard deviations that were calculated for different months. One can only conclude that standard deviations are greater than 10% and less than 60% of the average monthly wind power. A ±30% standard deviation would be the best guess for extrapolation to other locations, and it would be a fair generalization for this collection.

TIME SERIES INTEGRATION

This calculation was an attempt to assess cumulative effects of wind variability and serial correlation on the long term productivity of a wind turbine installation. In a first approach described here, it was assumed that all available wind power was collected. More sophisticated approaches, considering turbine

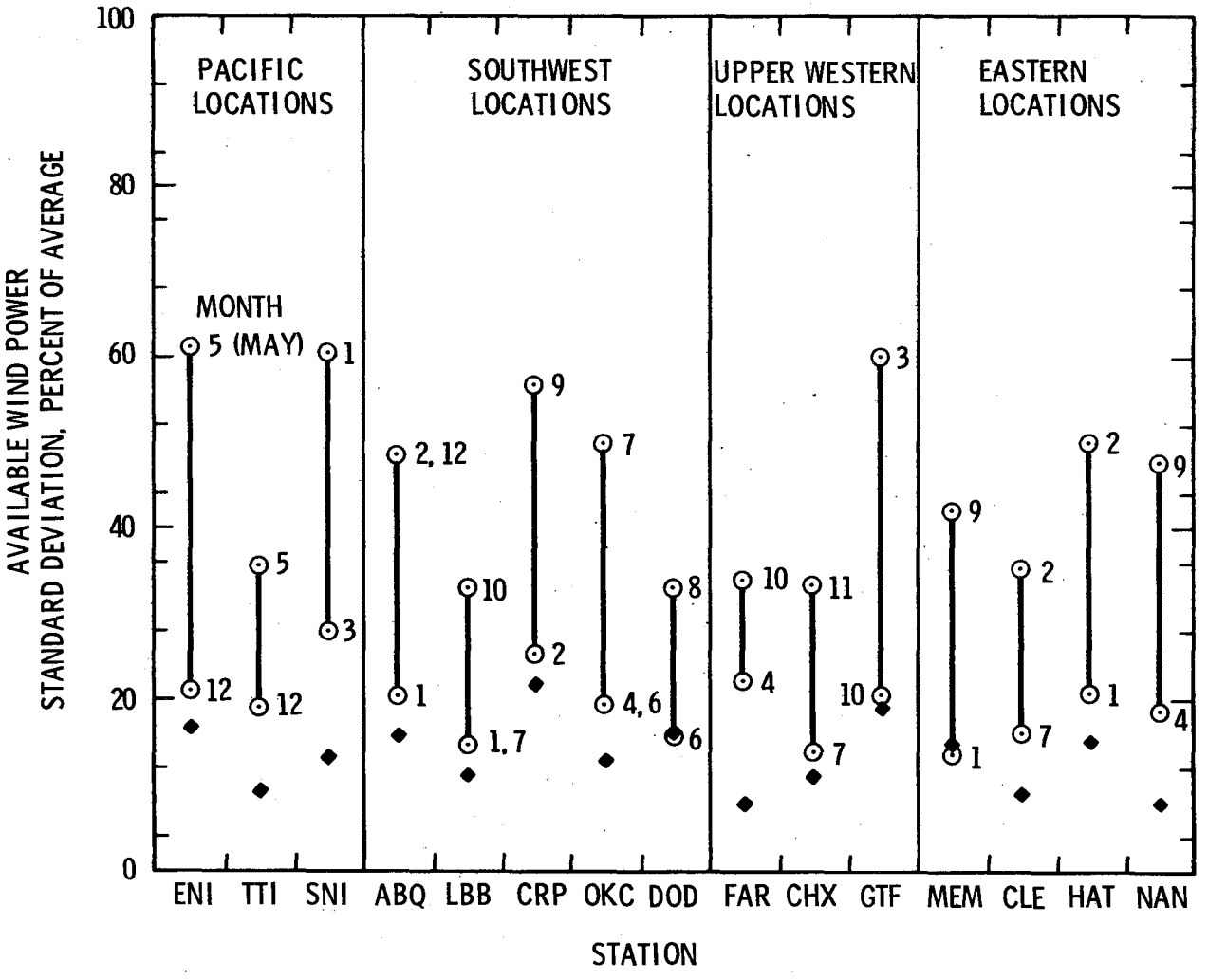

FIGURE 6. Standard Deviations in Available Wind Power, Monthly and Annual Statistics. Open Symbols show extremes of monthly values, numbers identify the month. Solid symbols show interannual values.

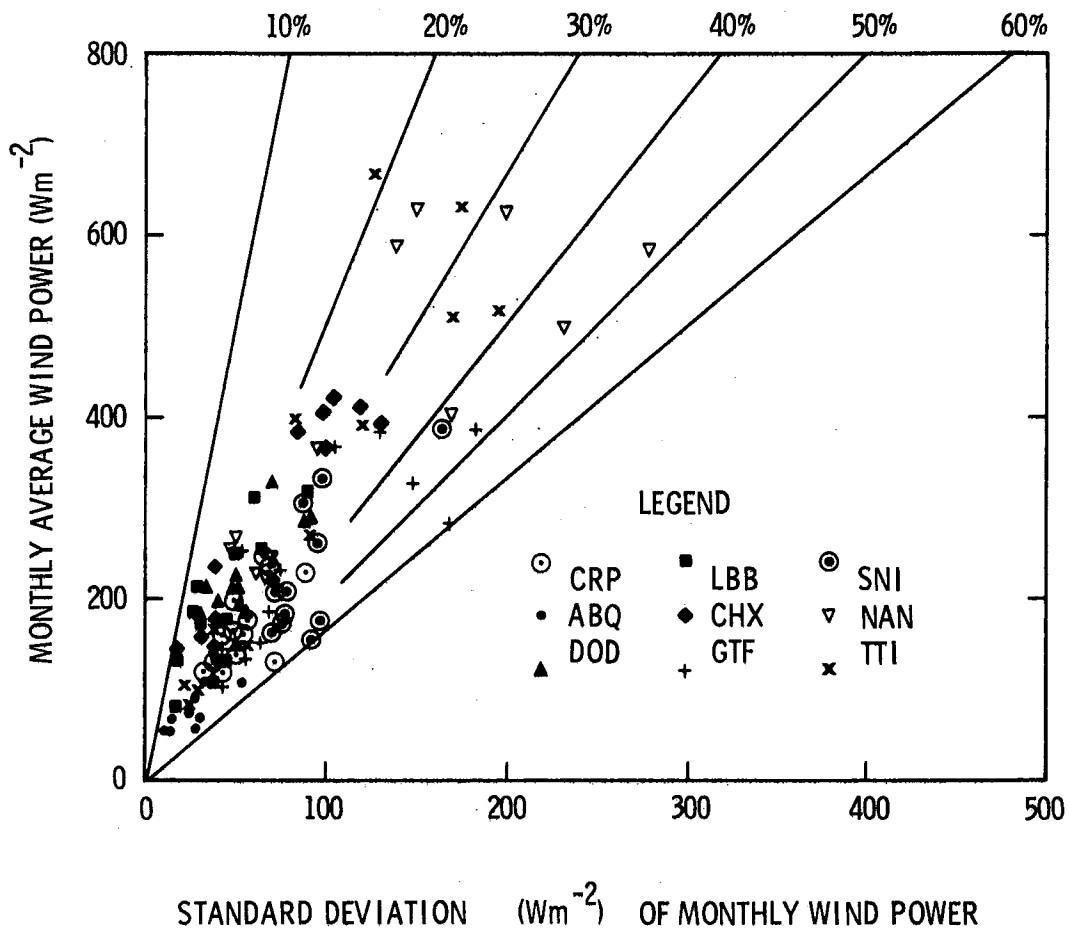

FIGURE 7. Standard Deviations of Available Wind Power versus Monthly Averages.

cut-in, rated, and cut-off speed "limits" summarized by a performance function, will be reported in the future.

The approach used here was to make a running sum of the deviations from the average wind power over the ten year record of hourly wind observations. This may be envisioned as the deduction of a constant demand from the variable hourly supply, with a running account kept of the balance. With demand set equal to the average supply, the balance is zero at the end of the period.

Results can be linearly scaled to specific situations. If a 1.5 kW average demand occurred at a 150 Wm^{-2} location, ten square meters of 100% efficient collectors would be required, or fifty square meters of uniformly 20% efficient collectors would be required to meet the demand, as averaged over the ten year period. Complications from turbine speed limits do not significantly change the general conclusions from this analysis, because most machines neglect little energy in light winds below cut-in speed or in rare high winds above cut-off speed. Specific performance functions should be tailored to the local wind regime, so that the output probability distribution function (PDF), at least roughly conforms to the wind speed occurrence PDF. Then the simple linear scaling of results should be reasonably accurate.

Results of these ten-year cumulative calculations are shown in Table III and Figure 8 (8.1 - 8.4) for the fifteen stations, grouped by geographic region. Amplitude scales are shown in both joules and kilowatt-hours per square meter on the left of each figure. Local scales, in percent of one year average production, are provided on the right for reference. A 1.8 GJ (500 kWhr) deviation is much more significant to an operator in a 100 Wm^{-2} (3.2 GJ or 876 kWhr per square meter per year) climate than in a 500 Wm^{-2} (15.8 GJ/m^2 or 4380 $kWhr/m^2$ per year) climate.

At many stations the annual oscillation, from very windy to less windy months, is evident and dominant. At others, however, longer term oscillations appear to be most significant.

Table III also summarizes numerical results of cumulative wind energy excursions in comparison to station averages. The amplitude of long period fluctuations ranges from 36% to 38% of an average annual product at maritime stations San Nicolas Island, Nantucket Shoals, and Enewetak. The largest proportional fluctuation (91%) occurs at Great Falls. Amplitude fluctuations in the central and plains sections generally range over 40% to 60% of a one year average production.

The average time between maxima and minima is 4.27 years. If extremes occurred randomly in a ten year record, the average interval would be slightly less, 3.67 years.

TABLE III. Summary of Long Term Wind Power Variability Characteristics
Height: 10 m

Location	Annual Averages*			Cumulative Balances**									Seasonal Statistics				
	Wind Power	Energy		Maxima				Minima				Amplitude Range	Windiest Month	Monthly Average	Quietest Month	Monthly Average	Annual Oscillation Amplitude
	(W/m^2)	(GJ/m^2)	($kWhr/m^2$)	(GJ/m^2)	($kWhr/m^2$)	(%)	Year	(GJ/m^2)	$kWhr/m^2$)	(%)	Year	(%)		(W/m^2)		(W/m^2)	(%)
Enewetak, M.I.	264	8.32	2312	1.12	310	13	1957	-2.03	-563	-24	1962	38	1	396	8	89	116
Tatoosh Is, WA	340	10.73	2981	1.97	547	18	1961	-3.34	-927	-31	1959	49	12	672	8	82	173
San Nicolas Is, CA	229	7.22	2006	1.49	414	21	1956	-1.07	-298	-15	1963	36	5	387	10	143	106
Albuquerque, NM	97	3.07	854	1.05	293	34	1956	-0.63	-174	-20	1959	55	4	161	8	58	106
Lubbock, TX	201	6.33	1758	2.28	632	36	1957	-0.60	-166	-9	1961	45	3	319	8	82	118
Corpus Christi, TX	177	5.57	1548	3.10	862	56	1962	-0.75	-207	-13	1957	69	4	245	12	120	71
Oklahoma City, OK	194	6.11	1697	2.58	717	42	1959	-0.24	-67	-4	1964	46	3	286	8	111	90
Dodge City, KS	228	7.19	1997	1.20	332	17	1955	-3.00	-834	-42	1963	58	4	329	8	155	77
Fargo, ND	176	5.55	1541	1.07	296	19	1957	-1.18	-329	-21	1961	41	4	260	7	84	100
Cheyenne, WY	292	9.21	2559	2.49	692	27	1961	-1.92	-532	-21	1963	48	12	415	7	130	97
Great Falls, MT	251	7.91	2195	3.99	1109	50	1959	-3.21	-892	-41	1962	91	12	387	7	107	112
Memphis, TN	83	2.61	725	0.52	145	20	1956	-1.11	-308	-42	1959	62	3	134	8	36	119
Cleveland, OH	149	4.70	1305	1.93	536	41	1959	-0.73	-204	-16	1955	57	3	215	8	72	95
Cape Hatteras, NC	145	4.59	1274	2.08	577	45	1959	-0.54	-150	-12	1955	57	12	201	6	84	81
Nantucket Shoals, MA	405	12.77	3548	1.36	377	11	1962	-3.39	-941	-26	1957	37	12	632	5	229	99

* - Calculated from smoothed wind speed distribution functions.
** - Calculated from hourly reports or estimates (no smoothing).

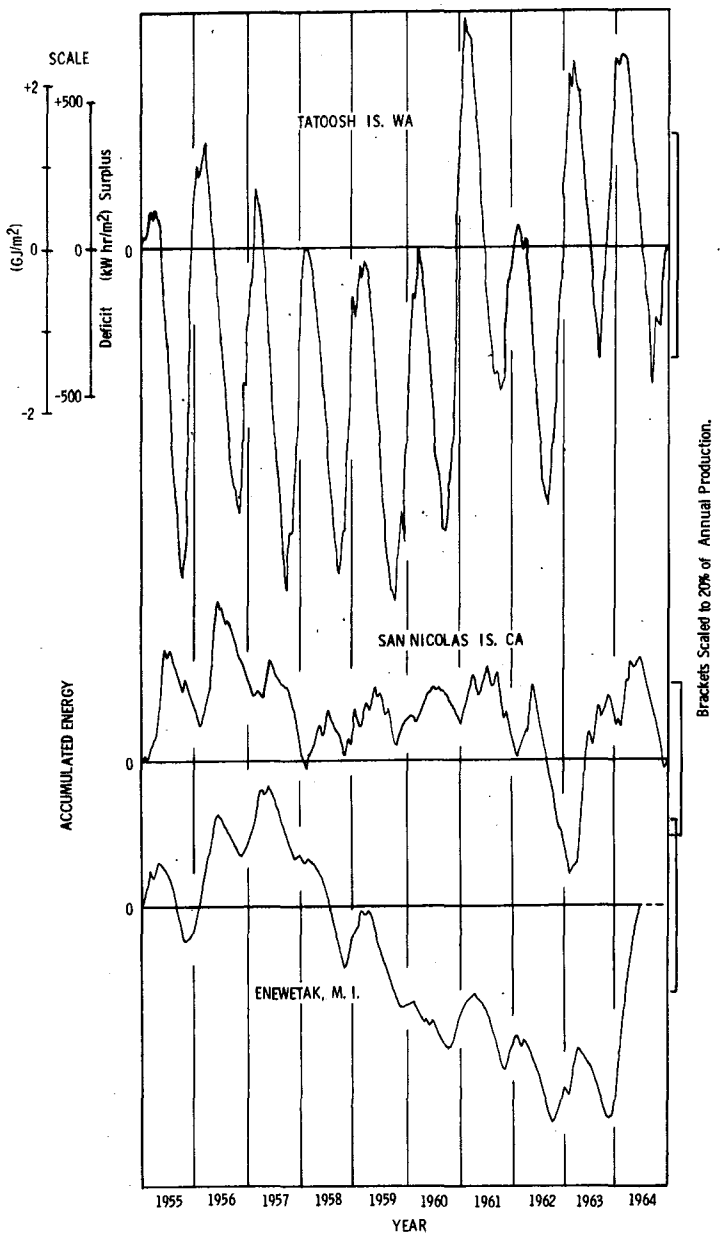

Figure 8.1. Cumulative Total, Production Minus Constant Demand (Average Production), Pacific Locations

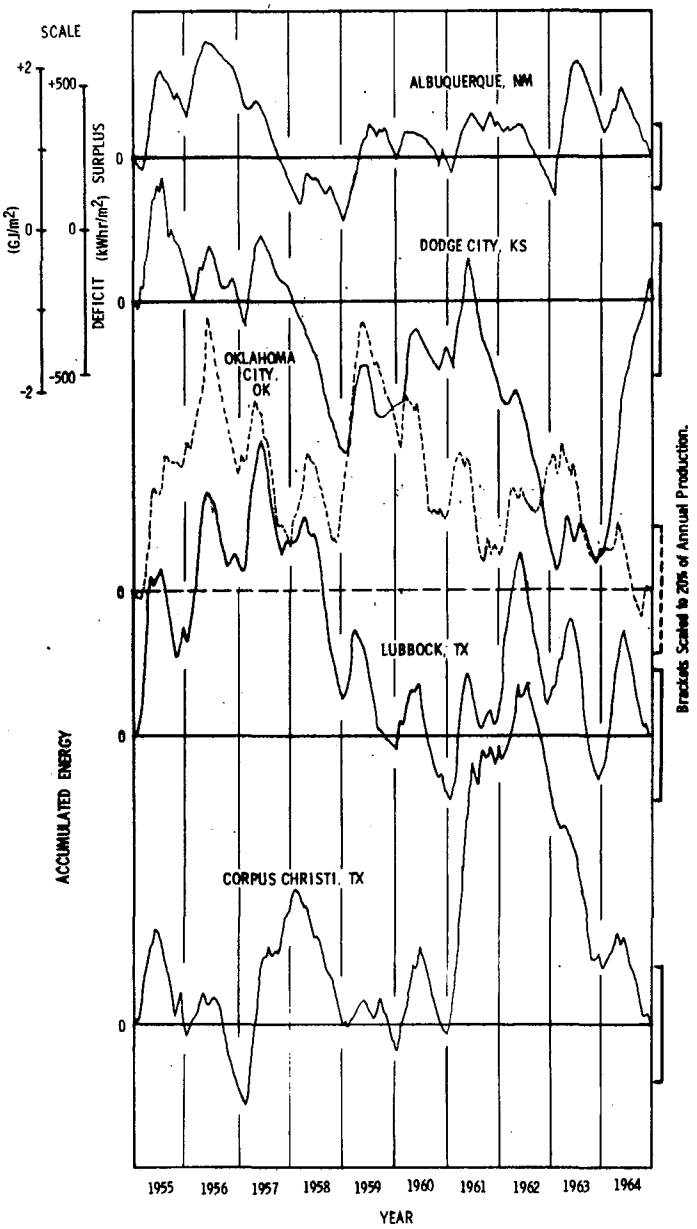

Figure 8.2 Cumulative Total, Production Minus Constant Demand (Average Production), Southwest Locations.

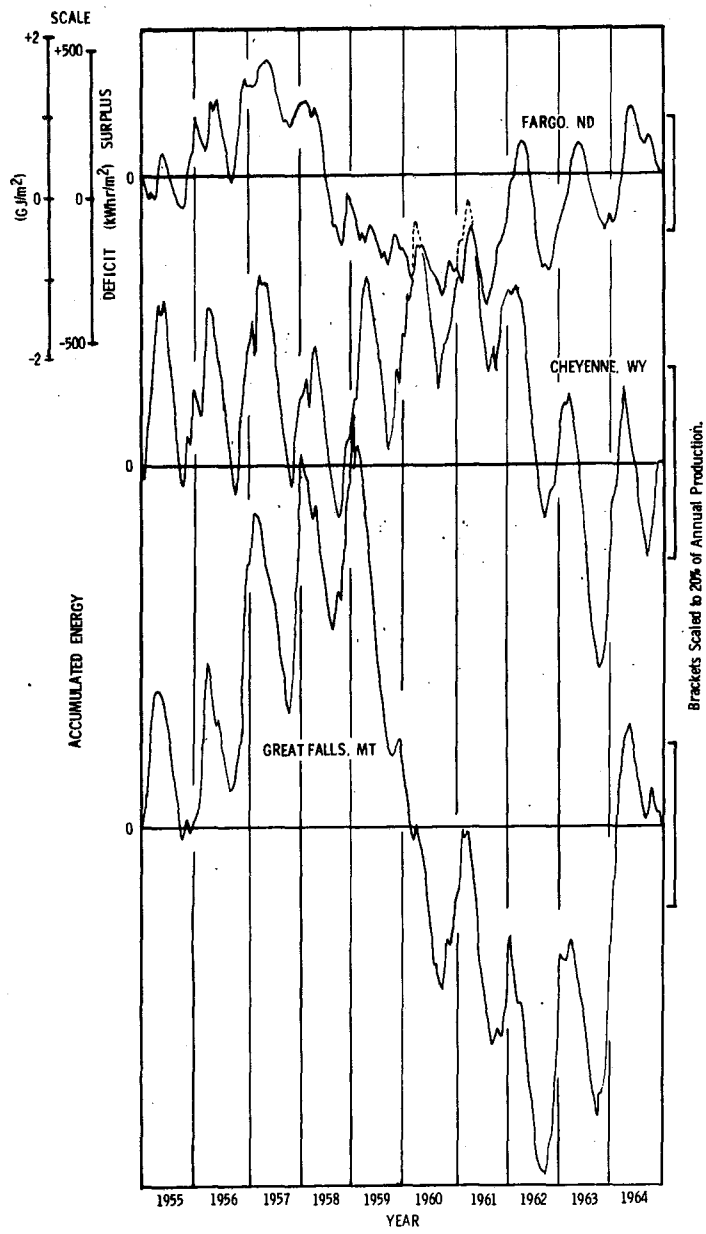

Figure 8.3 Cumulative Total, Production Minus Constant Demand (Average Production), Upper Western Locations.

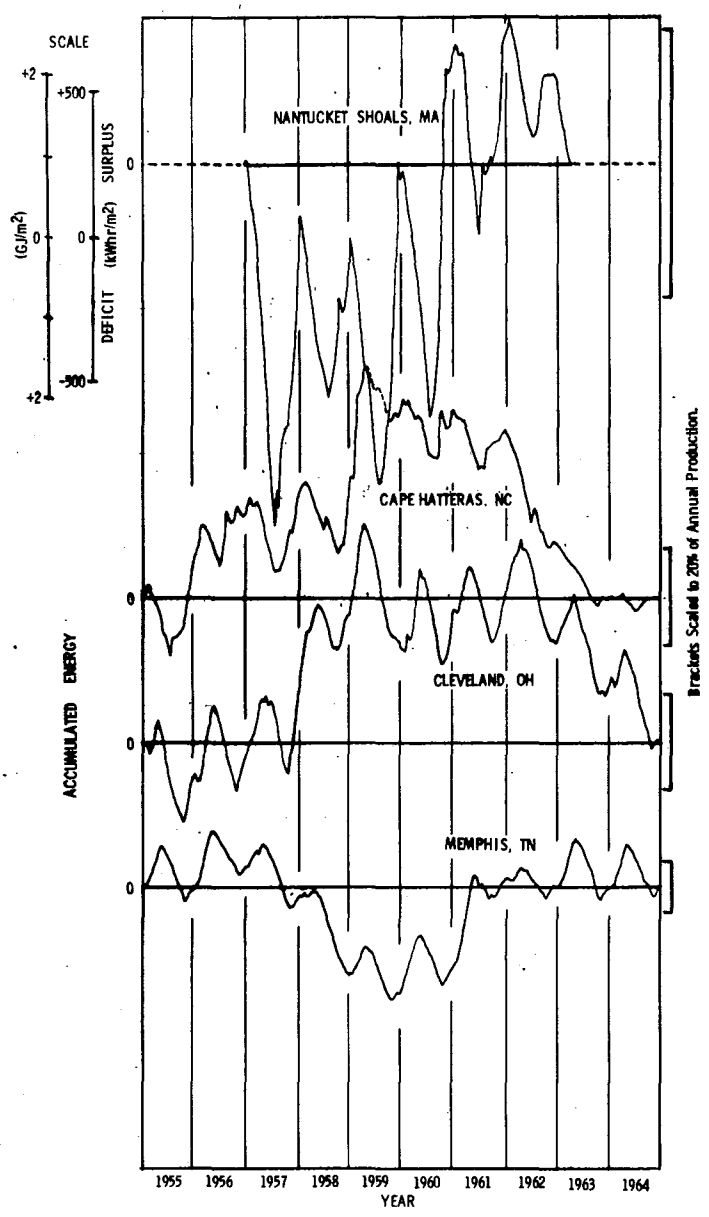

Figure 8.4 Cumulative Total, Production Minus Constant Demand (Average Production), Eastern Locations.

Wind power production rates, in Wm^{-2}, vary considerably during the course of a year. The peak-to-peak amplitude of this annual cyclic variation, on the average, is nearly equal to the annual average production rate. Corpus Christi shows the smallest seasonal cyclic amplitude of 71% of the local average supply. Tatoosh Island shows a very large seasonal cyclic amplitude, 173% of the average. At most stations, excepting Tatoosh Island, the quietest month offers roughly half the annual average wind power. Detailed monthly productions are tabulated in the Appendix.

SUMMARY

Available wind power was calculated from hourly wind speed observations at fifteen selected weather stations for ten years of record. Monthly and annual accumulations were prepared for 10 m, 20 m, and 50 m heights. Statistics were prepared and analyzed, including averages, standard deviations, and time-lag correlation coefficients for each exposure.

Results showed that there were modest month-to-month and year-to-year correlations in available wind power. There was no apparent correlation of long-term oscillation between stations. Monthly standard deviations generally average near ±30%, but range from ±10% to ±60% for specific sites and months. Annual standard deviations of about ±15% of annual average production should be expected for most locations.

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6. J. W. Reed, "Wind Power Climatology of the United States," SAND 74-0348, Sandia Laboratories, Albuquerque, NM, June 1975.

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APPENDIX

MONTHLY AND ANNUAL WIND POWER SUMMARIES

The following tables show the average available wind power (watts per square meter), for each month of the ten-year record of hourly wind speed observations, at fifteen selected weather stations. For each station, the first (top) table shows results at the actual final anemometer height (adjusted for anemometer moves where necessary). The subsequent three tables for each station give estimated results at 10 m, 20 m and 50 m above the ground.

Monthly averages and monthly standard deviations are listed for each of the twelve months and four heights. Annual averages are shown for each of the ten years, along with the ten year average and the yearly standard deviation (interannual variation). Annual energy (power x time) availability is shown for each year, with ten year averages and standard deviations for one square meter, in both common units of kilowatt hours and SI units of gigajoules.

Finally, the month-to-month and year-to-year correlation coefficients are shown, which are independent of height.

Table A-I: Monthly and Annual Wind Power Summary, Corpus Christi, TX

12926 CORPUS CHRISTI, TX ANEMOMETER AT 7. METERS (22. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	144.	114.	111.	207.	140.	117.	152.	159.	62.	122.	133.	36.	27.17
2	219.	181.	132.	164.	118.	216.	221.	141.	103.	141.	164.	41.	25.36
3	270.	154.	253.	103.	161.	162.	267.	169.	92.	171.	180.	60.	33.34
4	175.	199.	276.	125.	166.	232.	330.	192.	141.	199.	204.	59.	28.77
5	193.	136.	268.	83.	163.	219.	346.	247.	118.	117.	189.	78.	41.08
6	124.	117.	179.	111.	158.	170.	286.	138.	108.	152.	154.	50.	32.28
7	81.	155.	158.	146.	106.	126.	216.	165.	92.	88.	133.	40.	30.37
8	59.	127.	153.	108.	115.	120.	65.	100.	72.	143.	106.	31.	28.71
9	95.	74.	139.	69.	164.	53.	255.	88.	44.	76.	106.	61.	57.55
10	77.	61.	154.	121.	133.	107.	119.	118.	35.	69.	99.	35.	35.47
11	189.	115.	224.	83.	127.	85.	167.	81.	136.	116.	132.	45.	34.35
12	78.	70.	149.	71.	77.	98.	116.	77.	132.	119.	99.	27.	27.32
AVG.	142.	125.	183.	116.	136.	142.	212.	140.	95.	126.	142.	32.	22.36
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1243.	1098.	1601.	1016.	1187.	1243.	1855.	1223.	830.	1104.	1240.	277.	
GJ /SQ.M.	4.48	3.95	5.77	3.66	4.27	4.47	6.68	4.40	2.99	3.97	4.46	1.00	

12926 CORPUS CHRISTI, TX ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	173.	138.	134.	250.	167.	143.	183.	191.	74.	146.	160.	43.	27.11
2	263.	218.	159.	198.	143.	257.	264.	171.	124.	169.	197.	49.	24.93
3	323.	187.	302.	127.	193.	196.	318.	202.	112.	205.	217.	71.	32.69
4	212.	239.	329.	154.	202.	278.	389.	232.	173.	242.	245.	67.	27.50
5	234.	167.	319.	101.	198.	263.	409.	297.	147.	145.	228.	90.	39.63
6	153.	144.	217.	138.	192.	206.	341.	169.	134.	185.	188.	58.	30.77
7	102.	189.	194.	179.	131.	155.	259.	202.	113.	108.	163.	48.	29.35
8	74.	156.	187.	134.	143.	148.	79.	121.	90.	174.	131.	37.	28.37
9	114.	91.	169.	85.	200.	65.	308.	108.	54.	94.	129.	73.	56.79
10	93.	74.	187.	147.	159.	130.	145.	146.	42.	84.	121.	43.	35.44
11	227.	138.	267.	100.	151.	103.	199.	99.	166.	140.	159.	54.	33.86
12	94.	86.	181.	86.	93.	120.	141.	93.	158.	143.	120.	33.	27.21
AVG.	172.	152.	220.	141.	164.	172.	253.	169.	116.	153.	171.	37.	21.70
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1506.	1333.	1931.	1239.	1440.	1506.	2216.	1483.	1014.	1339.	1501.	326.	
GJ /SQ.M.	5.42	4.80	6.95	4.46	5.18	5.42	7.98	5.34	3.65	4.82	5.40	1.17	

12926 CORPUS CHRISTI, TX ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	233.	185.	180.	335.	226.	189.	245.	255.	99.	195.	214.	58.	27.15
2	356.	293.	215.	266.	191.	351.	357.	228.	167.	227.	265.	67.	25.43
3	435.	252.	410.	168.	261.	264.	429.	271.	149.	276.	292.	97.	33.12
4	282.	323.	447.	205.	270.	377.	530.	308.	229.	322.	329.	94.	28.49
5	314.	220.	436.	135.	263.	354.	556.	398.	191.	190.	305.	125.	40.79
6	201.	190.	290.	181.	257.	277.	461.	224.	175.	245.	250.	80.	31.95
7	133.	251.	255.	239.	172.	204.	347.	268.	149.	142.	216.	65.	30.05
8	98.	207.	247.	176.	188.	194.	105.	161.	117.	228.	172.	49.	28.42
9	153.	121.	225.	113.	264.	87.	409.	141.	72.	123.	171.	97.	56.91
10	126.	99.	251.	196.	217.	173.	194.	192.	57.	112.	162.	58.	35.59
11	305.	188.	363.	136.	206.	139.	271.	130.	218.	186.	214.	73.	34.27
12	126.	114.	241.	115.	126.	160.	189.	124.	212.	192.	160.	43.	27.12
AVG.	230.	204.	297.	189.	220.	231.	341.	225.	153.	203.	229.	51.	22.23
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2017.	1783.	2599.	1654.	1928.	2021.	2988.	1971.	1339.	1779.	2008.	446.	
GJ /SQ.M.	7.26	6.42	9.36	5.95	6.94	7.27	10.76	7.10	4.82	6.40	7.23	1.61	

12926 CORPUS CHRISTI, TX ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	339.	270.	262.	493.	332.	277.	361.	376.	147.	290.	315.	86.	27.21
2	519.	431.	312.	389.	280.	512.	527.	335.	246.	334.	388.	99.	25.37
3	639.	364.	600.	245.	385.	384.	634.	402.	217.	407.	428.	143.	33.34
4	416.	473.	657.	298.	396.	549.	787.	456.	335.	474.	484.	140.	28.92
5	458.	323.	637.	196.	386.	521.	825.	587.	280.	278.	449.	185.	41.26
6	293.	276.	426.	263.	375.	402.	678.	328.	256.	362.	366.	118.	32.35
7	193.	368.	374.	347.	251.	299.	513.	390.	218.	208.	316.	96.	30.42
8	141.	302.	362.	257.	274.	284.	152.	237.	171.	339.	252.	73.	28.87
9	224.	176.	329.	164.	389.	125.	602.	210.	105.	180.	250.	144.	57.36
10	183.	144.	364.	286.	315.	255.	283.	280.	83.	164.	236.	83.	35.41
11	449.	274.	529.	198.	300.	202.	397.	192.	324.	277.	314.	108.	34.24
12	184.	166.	352.	168.	183.	232.	275.	182.	313.	282.	234.	64.	27.32
AVG.	336.	297.	434.	275.	322.	337.	503.	331.	225.	300.	336.	75.	22.39
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2948.	2604.	3800.	2412.	2821.	2950.	4406.	2903.	1967.	2624.	2943.	659.	
GJ /SQ.M.	10.61	9.37	13.68	8.68	10.15	10.62	15.86	10.45	7.08	9.45	10.60	2.37	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .4721
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = -.0977

Table A-II: Monthly and Annual Wind Power Summary, Albuquerque, NM

23050 ALBUQUERQUE, NM ANEMOMETER AT 7. METERS (23. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	51.	40.	47.	46.	46.	42.	38.	74.	54.	46.	48.	10.	19.75
2	70.	194.	45.	65.	144.	142.	52.	59.	84.	103.	96.	47.	48.73
3	145.	141.	72.	59.	119.	92.	139.	88.	165.	118.	114.	33.	29.00
4	201.	132.	113.	179.	147.	105.	121.	75.	212.	95.	138.	44.	31.71
5	126.	99.	74.	61.	158.	84.	131.	93.	167.	114.	111.	33.	30.06
6	149.	77.	54.	87.	99.	64.	106.	86.	146.	97.	96.	30.	30.75
7	75.	87.	44.	74.	124.	86.	79.	53.	96.	42.	76.	24.	31.28
8	51.	51.	32.	47.	41.	59.	64.	39.	68.	49.	50.	11.	21.13
9	56.	64.	42.	84.	79.	61.	57.	59.	43.	51.	60.	13.	21.69
10	68.	80.	41.	85.	110.	62.	71.	71.	26.	48.	66.	23.	34.10
11	80.	54.	61.	50.	50.	48.	129.	38.	36.	56.	60.	26.	42.72
12	44.	37.	43.	40.	35.	120.	58.	52.	46.	33.	51.	24.	47.75
AVG.	93.	88.	56.	73.	96.	80.	87.	65.	95.	71.	80.	13.	16.19
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	815.	770.	489.	642.	842.	704.	763.	573.	834.	620.	705.	114.	
GJ /SQ.M.	2.93	2.77	1.76	2.31	3.03	2.53	2.75	2.06	3.00	2.23	2.54	.41	

23050 ALBUQUERQUE, NM ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	59.	46.	54.	54.	53.	48.	45.	86.	64.	53.	56.	11.	20.32
2	80.	224.	52.	76.	164.	166.	60.	69.	96.	120.	111.	54.	48.60
3	167.	164.	84.	69.	139.	108.	163.	102.	193.	139.	133.	38.	28.85
4	234.	154.	132.	208.	170.	122.	142.	88.	247.	113.	161.	51.	31.38
5	147.	115.	88.	71.	185.	99.	154.	109.	194.	134.	130.	39.	29.76
6	173.	89.	64.	101.	115.	75.	124.	102.	171.	113.	113.	34.	30.54
7	85.	100.	52.	86.	144.	101.	93.	63.	113.	48.	88.	28.	31.28
8	58.	59.	36.	54.	47.	69.	76.	45.	79.	57.	58.	13.	22.05
9	64.	73.	48.	98.	91.	71.	68.	69.	49.	60.	69.	15.	21.99
10	77.	92.	47.	99.	127.	72.	83.	82.	30.	56.	77.	26.	34.25
11	93.	63.	72.	58.	58.	57.	151.	45.	41.	66.	70.	30.	42.97
12	50.	42.	49.	45.	40.	140.	69.	61.	53.	38.	59.	28.	48.58
AVG.	107.	102.	65.	85.	111.	94.	102.	77.	111.	83.	94.	15.	15.95
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	941.	889.	568.	745.	973.	823.	896.	672.	970.	728.	821.	131.	
GJ /SQ.M.	3.39	3.20	2.04	2.68	3.50	2.96	3.23	2.42	3.49	2.62	2.95	.47	

23050 ALBUQUERQUE, NM ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	81.	62.	72.	72.	72.	64.	60.	115.	84.	72.	76.	15.	20.01
2	109.	306.	69.	101.	225.	222.	80.	93.	132.	162.	150.	74.	49.16
3	225.	220.	111.	93.	186.	145.	218.	137.	260.	185.	178.	52.	29.15
4	314.	206.	177.	282.	230.	164.	190.	117.	334.	149.	216.	69.	31.71
5	197.	154.	115.	95.	248.	131.	206.	146.	262.	178.	173.	53.	30.36
6	234.	120.	84.	135.	155.	100.	165.	135.	229.	152.	151.	47.	30.93
7	115.	135.	69.	115.	195.	134.	124.	83.	150.	65.	119.	37.	31.44
8	79.	79.	50.	74.	64.	93.	101.	61.	106.	77.	78.	17.	21.58
9	87.	99.	66.	131.	123.	95.	90.	93.	67.	80.	93.	20.	21.57
10	106.	124.	63.	133.	174.	98.	112.	111.	41.	75.	104.	36.	34.39
11	125.	85.	95.	77.	78.	75.	203.	60.	56.	88.	94.	40.	42.94
12	69.	57.	67.	63.	54.	189.	91.	81.	72.	51.	79.	38.	48.18
AVG.	145.	137.	87.	114.	150.	126.	137.	103.	150.	111.	126.	20.	16.27
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1271.	1203.	759.	1001.	1316.	1102.	1198.	900.	1310.	974.	1103.	180.	
GJ /SQ.M.	4.58	4.33	2.73	3.60	4.74	3.97	4.31	3.24	4.72	3.51	3.97	.65	

23050 ALBUQUERQUE, NM ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	122.	95.	110.	111.	111.	99.	91.	172.	128.	107.	115.	22.	19.10
2	165.	453.	106.	155.	336.	332.	121.	138.	193.	240.	224.	108.	48.43
3	339.	330.	170.	142.	281.	214.	323.	204.	384.	277.	266.	76.	28.58
4	475.	311.	267.	421.	345.	244.	282.	178.	492.	223.	324.	102.	31.53
5	299.	233.	178.	146.	373.	196.	305.	217.	388.	266.	260.	77.	29.59
6	351.	181.	130.	204.	235.	150.	247.	203.	340.	227.	227.	69.	30.32
7	177.	204.	106.	176.	292.	201.	186.	125.	225.	98.	179.	56.	31.08
8	123.	122.	77.	113.	99.	139.	152.	92.	158.	115.	119.	25.	20.62
9	133.	150.	101.	200.	186.	143.	135.	139.	100.	119.	141.	31.	21.91
10	161.	189.	99.	202.	258.	145.	167.	164.	63.	111.	156.	53.	33.89
11	190.	130.	146.	119.	120.	113.	301.	89.	85.	132.	142.	60.	42.08
12	104.	87.	101.	95.	83.	279.	137.	122.	108.	77.	119.	56.	46.67
AVG.	220.	207.	133.	174.	227.	188.	204.	154.	222.	166.	189.	30.	16.02
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1926.	1815.	1162.	1522.	1985.	1645.	1786.	1346.	1944.	1454.	1659.	266.	
GJ /SQ.M.	6.93	6.53	4.18	5.48	7.15	5.92	6.43	4.85	7.00	5.24	5.97	.96	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .2402
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = -.3249

Table A-III: Monthly and Annual Wind Power Summary, Memphis TN

13893 MEMPHIS, TN ANEMOMETER AT 7. METERS (22. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	79.	88.	92.	57.	87.	95.	90.	71.	76.	84.	82.	11.	13.36
2	101.	125.	79.	74.	75.	127.	94.	52.	92.	70.	89.	23.	25.53
3	134.	128.	67.	67.	111.	90.	166.	91.	122.	132.	111.	30.	27.18
4	80.	98.	84.	81.	68.	92.	151.	79.	104.	117.	95.	23.	23.98
5	47.	69.	66.	37.	53.	83.	88.	63.	65.	62.	63.	14.	22.67
6	31.	43.	40.	40.	42.	44.	54.	36.	42.	48.	42.	6.	13.99
7	29.	37.	26.	30.	21.	30.	56.	43.	41.	28.	34.	10.	28.46
8	31.	36.	28.	17.	23.	28.	25.	53.	26.	36.	30.	9.	31.13
9	26.	63.	20.	29.	41.	32.	72.	53.	27.	42.	41.	16.	40.65
10	55.	30.	48.	25.	51.	28.	67.	60.	25.	41.	43.	15.	33.76
11	98.	78.	57.	48.	94.	92.	102.	78.	71.	45.	76.	20.	26.02
12	65.	66.	98.	42.	75.	110.	73.	78.	72.	95.	77.	18.	23.83
AVG.	65.	72.	59.	46.	62.	71.	87.	63.	64.	67.	65.	10.	15.11
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	566.	629.	514.	400.	542.	621.	758.	552.	556.	584.	572.	86.	
GJ /SQ.M.	2.04	2.26	1.85	1.44	1.95	2.24	2.73	1.99	2.00	2.10	2.06	.31	

13893 MEMPHIS, TN ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	95.	106.	111.	68.	106.	115.	108.	86.	91.	102.	99.	13.	13.45
2	123.	150.	95.	89.	91.	152.	115.	63.	111.	85.	107.	27.	25.12
3	161.	154.	81.	81.	135.	110.	200.	111.	149.	160.	134.	36.	26.93
4	95.	118.	101.	97.	83.	112.	182.	97.	127.	142.	115.	28.	23.89
5	56.	84.	79.	44.	64.	101.	107.	76.	80.	76.	77.	18.	23.17
6	36.	51.	47.	48.	50.	52.	66.	42.	50.	58.	50.	8.	15.03
7	33.	43.	30.	35.	24.	35.	68.	51.	50.	33.	40.	12.	30.66
8	36.	42.	33.	19.	27.	33.	28.	65.	31.	44.	36.	12.	33.37
9	30.	75.	22.	34.	49.	38.	88.	65.	32.	52.	49.	20.	41.96
10	66.	35.	57.	30.	62.	34.	81.	74.	29.	50.	52.	18.	35.15
11	118.	95.	68.	58.	114.	111.	124.	95.	86.	53.	92.	24.	26.24
12	78.	80.	118.	51.	91.	133.	89.	94.	88.	117.	94.	22.	23.93
AVG.	77.	86.	70.	55.	75.	85.	105.	77.	77.	81.	79.	12.	15.31
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	677.	754.	614.	478.	654.	747.	916.	672.	675.	709.	690.	106.	
GJ /SQ.M.	2.44	2.71	2.21	1.72	2.36	2.69	3.30	2.42	2.43	2.55	2.48	.38	

13893 MEMPHIS, TN ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	128.	141.	149.	91.	142.	153.	146.	116.	123.	136.	132.	18.	13.36
2	163.	201.	127.	119.	122.	204.	153.	85.	149.	113.	144.	36.	25.27
3	216.	206.	108.	108.	181.	146.	268.	147.	197.	213.	179.	49.	27.15
4	128.	158.	136.	130.	110.	149.	243.	128.	167.	189.	154.	37.	23.94
5	75.	111.	106.	60.	86.	135.	141.	101.	106.	102.	102.	23.	22.76
6	50.	69.	64.	64.	68.	71.	87.	58.	68.	77.	68.	10.	14.14
7	46.	59.	42.	49.	34.	48.	90.	69.	68.	45.	55.	16.	28.55
8	50.	57.	45.	28.	38.	46.	40.	88.	42.	59.	49.	15.	31.41
9	42.	101.	32.	47.	67.	51.	117.	87.	44.	69.	66.	27.	40.63
10	88.	48.	77.	41.	84.	46.	109.	98.	40.	67.	70.	24.	33.88
11	158.	126.	91.	78.	153.	149.	167.	127.	113.	72.	123.	32.	26.27
12	104.	106.	158.	68.	122.	177.	118.	126.	117.	154.	125.	29.	23.60
AVG.	104.	115.	95.	74.	101.	115.	140.	102.	103.	108.	106.	16.	15.11
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	911.	1009.	828.	645.	881.	1003.	1226.	897.	902.	946.	925.	140.	
GJ /SQ.M.	3.28	3.63	2.98	2.32	3.17	3.61	4.41	3.23	3.25	3.41	3.33	.50	

13893 MEMPHIS, TN ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	187.	208.	217.	135.	206.	226.	215.	168.	180.	198.	194.	26.	13.44
2	238.	295.	186.	176.	177.	300.	223.	124.	217.	165.	210.	54.	25.56
3	315.	301.	158.	159.	264.	214.	395.	215.	290.	313.	262.	72.	27.29
4	187.	231.	197.	191.	160.	217.	358.	186.	246.	278.	225.	55.	24.31
5	111.	164.	156.	88.	126.	196.	208.	148.	153.	147.	150.	34.	22.78
6	73.	100.	94.	95.	98.	104.	128.	85.	99.	113.	99.	14.	14.25
7	68.	88.	62.	72.	49.	70.	131.	101.	98.	66.	80.	23.	28.45
8	72.	84.	65.	41.	55.	67.	58.	126.	62.	86.	72.	22.	30.86
9	62.	148.	47.	68.	98.	75.	171.	127.	64.	99.	96.	39.	40.50
10	129.	72.	112.	60.	121.	67.	158.	142.	58.	98.	102.	34.	33.76
11	230.	186.	135.	114.	223.	219.	242.	185.	167.	105.	181.	47.	25.98
12	152.	155.	232.	98.	178.	260.	173.	184.	170.	226.	183.	44.	23.99
AVG.	152.	170.	138.	108.	146.	168.	205.	149.	150.	158.	154.	23.	15.21
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1333.	1485.	1213.	946.	1280.	1471.	1796.	1307.	1317.	1383.	1353.	206.	
GJ /SQ.M.	4.80	5.35	4.37	3.40	4.61	5.30	6.46	4.71	4.74	4.98	4.87	.74	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .3755
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .2357

Table A-IV: Monthly and Annual Wind Power Summary, Dodge City, KS

13985 DODGE CITY,KANSAS ANEMOMETER AT 6. METERS (20. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	163.	108.	142.	115.	160.	160.	174.	160.	155.	229.	157.	32.	20.17
2	249.	131.	128.	191.	160.	210.	131.	128.	134.	220.	168.	43.	25.73
3	246.	226.	323.	90.	353.	193.	219.	161.	299.	248.	236.	74.	31.35
4	333.	216.	254.	198.	250.	334.	287.	209.	217.	360.	266.	56.	21.13
5	235.	243.	192.	111.	225.	223.	317.	225.	142.	374.	229.	72.	31.51
6	181.	166.	212.	160.	152.	161.	133.	134.	188.	217.	170.	28.	16.15
7	177.	112.	128.	155.	68.	130.	113.	107.	213.	228.	143.	48.	33.21
8	65.	131.	121.	74.	137.	179.	75.	111.	144.	200.	124.	42.	34.30
9	168.	178.	132.	181.	175.	129.	173.	121.	158.	269.	168.	40.	23.51
10	148.	206.	165.	116.	150.	134.	150.	124.	126.	173.	149.	26.	17.29
11	155.	182.	165.	146.	212.	228.	146.	94.	185.	239.	175.	41.	23.57
12	138.	120.	167.	121.	186.	185.	127.	97.	186.	250.	158.	43.	27.40
AVG.	188.	168.	178.	138.	186.	189.	170.	139.	179.	251.	179.	30.	16.61
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1646.	1476.	1555.	1210.	1625.	1653.	1493.	1219.	1567.	2196.	1564.	260.	
GJ /SQ.M.	5.93	5.31	5.60	4.36	5.85	5.95	5.37	4.39	5.64	7.90	5.63	.94	

13985 DODGE CITY,KANSAS ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	202.	134.	177.	144.	200.	201.	218.	198.	191.	286.	195.	40.	20.28
2	307.	165.	158.	238.	199.	261.	162.	158.	166.	271.	209.	53.	25.54
3	307.	280.	401.	114.	437.	239.	273.	199.	369.	306.	293.	91.	31.16
4	413.	270.	317.	249.	309.	412.	354.	257.	268.	446.	329.	69.	20.95
5	290.	301.	237.	140.	278.	276.	394.	277.	178.	461.	283.	88.	31.21
6	224.	207.	264.	198.	188.	201.	166.	166.	231.	268.	211.	34.	15.99
7	218.	140.	161.	194.	86.	163.	141.	134.	261.	280.	178.	58.	32.40
8	85.	163.	152.	95.	171.	222.	95.	138.	179.	247.	155.	51.	33.15
9	207.	222.	166.	225.	217.	160.	214.	150.	197.	333.	209.	49.	23.28
10	185.	255.	205.	145.	186.	168.	186.	155.	158.	215.	186.	31.	16.69
11	193.	226.	206.	184.	264.	283.	182.	119.	230.	293.	218.	50.	23.02
12	171.	151.	210.	152.	231.	231.	158.	123.	233.	309.	197.	53.	26.91
AVG.	234.	209.	221.	173.	231.	235.	212.	173.	222.	310.	222.	36.	16.32
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2046.	1834.	1937.	1517.	2020.	2057.	1856.	1514.	1942.	2712.	1943.	317.	
GJ /SQ.M.	7.36	6.60	6.97	5.46	7.27	7.40	6.68	5.45	6.99	9.76	7.00	1.14	

13985 DODGE CITY,KANSAS ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	272.	179.	236.	191.	268.	266.	289.	265.	258.	382.	261.	53.	20.29
2	417.	218.	213.	319.	267.	352.	217.	212.	224.	367.	281.	73.	25.94
3	411.	378.	539.	149.	589.	323.	364.	268.	497.	414.	393.	124.	31.41
4	558.	361.	426.	330.	418.	559.	478.	349.	360.	600.	444.	94.	21.19
5	394.	407.	321.	184.	377.	374.	529.	375.	237.	624.	382.	120.	31.47
6	303.	275.	356.	265.	254.	268.	221.	222.	312.	360.	284.	46.	16.35
7	295.	186.	211.	259.	113.	216.	187.	177.	355.	381.	238.	80.	33.53
8	107.	220.	201.	121.	228.	299.	124.	183.	240.	332.	206.	71.	34.64
9	279.	298.	221.	302.	293.	214.	288.	200.	264.	449.	281.	66.	23.67
10	246.	345.	277.	192.	250.	223.	250.	206.	209.	287.	248.	43.	17.48
11	257.	304.	274.	245.	352.	380.	243.	156.	307.	400.	292.	69.	23.67
12	231.	200.	280.	202.	311.	308.	210.	159.	310.	417.	263.	73.	27.65
AVG.	314.	281.	296.	230.	310.	315.	283.	231.	298.	418.	298.	50.	16.69
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2752.	2461.	2596.	2014.	2716.	2762.	2483.	2024.	2609.	3660.	2608.	435.	
GJ /SQ.M.	9.91	8.86	9.34	7.25	9.78	9.94	8.94	7.29	9.39	13.18	9.39	1.57	

13985 DODGE CITY,KANSAS ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	404.	266.	350.	283.	395.	393.	430.	394.	383.	567.	387.	78.	20.24
2	613.	323.	317.	472.	395.	518.	324.	316.	332.	544.	415.	107.	25.66
3	605.	558.	796.	223.	870.	478.	539.	397.	737.	615.	582.	182.	31.28
4	819.	533.	625.	485.	616.	825.	709.	517.	536.	889.	655.	139.	21.19
5	580.	599.	473.	275.	558.	552.	781.	555.	355.	924.	565.	177.	31.34
6	446.	411.	523.	395.	376.	398.	331.	332.	463.	535.	421.	67.	15.93
7	439.	277.	315.	383.	169.	321.	281.	266.	528.	565.	354.	118.	33.20
8	163.	326.	299.	183.	339.	446.	187.	274.	358.	495.	307.	105.	34.15
9	415.	439.	326.	445.	434.	319.	429.	301.	393.	667.	417.	98.	23.51
10	365.	508.	409.	287.	371.	332.	373.	307.	314.	429.	369.	63.	17.00
11	382.	449.	407.	362.	521.	562.	362.	235.	457.	591.	433.	101.	23.41
12	342.	299.	414.	301.	457.	457.	315.	241.	465.	619.	391.	107.	27.29
AVG.	464.	416.	438.	341.	458.	467.	422.	345.	443.	620.	441.	73.	16.62
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	4069.	3643.	3836.	2989.	4015.	4089.	3694.	3019.	3883.	5431.	3867.	643.	
GJ /SQ.M.	14.65	13.12	13.81	10.76	14.45	14.72	13.30	10.87	13.98	19.55	13.92	2.31	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .3617
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .0031

Table A-V: Monthly and Annual Wind Power Summary, Nantucket Shoals,MA

14658 NANTUCKET SHOALS,MA ANEMOMETER AT 61. METERS (200. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	9999.	9999.	528.	1347.	697.	761.	1139.	1291.	324.	9999.	869.	365.	42.00
2	9999.	9999.	653.	680.	539.	532.	739.	499.	406.	9999.	578.	108.	18.61
3	9999.	9999.	376.	493.	452.	658.	546.	687.	292.	9999.	501.	132.	26.43
4	9999.	9999.	429.	681.	711.	533.	498.	494.	9999.	9999.	558.	103.	18.45
5	9999.	9999.	283.	669.	677.	526.	469.	338.	9999.	9999.	494.	150.	30.36
6	9999.	9999.	337.	651.	341.	501.	568.	733.	9999.	9999.	522.	148.	28.33
7	9999.	9999.	850.	709.	714.	587.	1225.	665.	9999.	9999.	792.	209.	26.36
8	9999.	9999.	583.	827.	980.	1060.	874.	2161.	9999.	9999.	1081.	505.	46.74
9	9999.	9999.	1558.	1084.	1034.	2262.	1404.	252.	9999.	9999.	1266.	607.	47.99
10	9999.	9999.	893.	1235.	1553.	1685.	1031.	9999.	9999.	9999.	1279.	301.	23.51
11	9999.	9999.	1505.	966.	1921.	1217.	1218.	9999.	9999.	9999.	1365.	326.	23.87
12	9999.	9999.	1289.	1344.	1113.	853.	2142.	9999.	9999.	9999.	1348.	432.	32.06
AVG.	9999.	9999.	774.	891.	894.	931.	988.	9999.	9999.	9999.	896.	70.	7.84
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	9999.	9999.	6778.	7802.	7834.	8158.	8651.	9999.	9999.	9999.	7845.	615.	
GJ /SQ.M.	99.99	99.99	24.40	28.09	28.20	29.37	31.15	99.99	99.99	99.99	28.24	2.21	

14658 NANTUCKET SHOALS,MA ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	9999.	9999.	245.	626.	324.	352.	526.	594.	150.	9999.	402.	169.	41.89
2	9999.	9999.	303.	315.	249.	247.	342.	229.	188.	9999.	268.	50.	18.75
3	9999.	9999.	174.	228.	209.	305.	252.	317.	135.	9999.	231.	61.	26.48
4	9999.	9999.	199.	316.	327.	246.	231.	228.	9999.	9999.	258.	47.	18.32
5	9999.	9999.	131.	311.	313.	244.	216.	157.	9999.	9999.	229.	69.	30.32
6	9999.	9999.	156.	302.	158.	233.	263.	338.	9999.	9999.	242.	68.	28.14
7	9999.	9999.	393.	328.	331.	271.	566.	308.	9999.	9999.	366.	96.	26.29
8	9999.	9999.	269.	382.	453.	490.	404.	998.	9999.	9999.	499.	233.	46.72
9	9999.	9999.	723.	500.	478.	1043.	652.	117.	9999.	9999.	586.	280.	47.87
10	9999.	9999.	412.	571.	719.	783.	479.	9999.	9999.	9999.	593.	140.	23.64
11	9999.	9999.	697.	448.	888.	562.	565.	9999.	9999.	9999.	632.	150.	23.77
12	9999.	9999.	597.	623.	515.	394.	993.	9999.	9999.	9999.	625.	201.	32.15
AVG.	9999.	9999.	358.	412.	414.	431.	458.	9999.	9999.	9999.	415.	33.	7.85
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	9999.	9999.	3139.	3613.	3624.	3774.	4009.	9999.	9999.	9999.	3632.	285.	
GJ /SQ.M.	99.99	99.99	11.30	13.01	13.05	13.59	14.43	99.99	99.99	99.99	13.07	1.03	

14658 NANTUCKET SHOALS,MA ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	9999.	9999.	327.	837.	434.	473.	707.	801.	202.	9999.	540.	227.	41.96
2	9999.	9999.	405.	419.	336.	331.	459.	312.	254.	9999.	359.	66.	18.35
3	9999.	9999.	234.	306.	282.	409.	340.	427.	183.	9999.	312.	82.	26.32
4	9999.	9999.	267.	421.	443.	332.	308.	307.	9999.	9999.	346.	64.	18.44
5	9999.	9999.	178.	416.	422.	327.	290.	211.	9999.	9999.	307.	93.	30.18
6	9999.	9999.	210.	406.	212.	312.	351.	457.	9999.	9999.	325.	92.	28.33
7	9999.	9999.	530.	440.	443.	363.	761.	412.	9999.	9999.	492.	130.	26.47
8	9999.	9999.	363.	513.	607.	659.	544.	1347.	9999.	9999.	672.	315.	46.94
9	9999.	9999.	972.	673.	643.	1403.	869.	159.	9999.	9999.	786.	376.	47.85
10	9999.	9999.	558.	769.	965.	1048.	642.	9999.	9999.	9999.	796.	186.	23.39
11	9999.	9999.	932.	600.	1190.	754.	754.	9999.	9999.	9999.	846.	202.	23.86
12	9999.	9999.	799.	835.	692.	531.	1337.	9999.	9999.	9999.	839.	270.	32.25
AVG.	9999.	9999.	481.	553.	556.	579.	614.	9999.	9999.	9999.	556.	43.	7.80
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	9999.	9999.	4216.	4844.	4869.	5069.	5375.	9999.	9999.	9999.	4874.	380.	
GJ /SQ.M.	99.99	99.99	15.18	17.44	17.53	18.25	19.35	99.99	99.99	99.99	17.55	1.37	

14658 NANTUCKET SHOALS,MA ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	9999.	9999.	474.	1224.	627.	685.	1036.	1176.	295.	9999.	788.	334.	42.37
2	9999.	9999.	590.	613.	481.	479.	664.	451.	370.	9999.	521.	96.	18.45
3	9999.	9999.	341.	446.	407.	589.	490.	616.	266.	9999.	450.	117.	26.04
4	9999.	9999.	389.	610.	638.	477.	445.	447.	9999.	9999.	501.	91.	18.25
5	9999.	9999.	257.	606.	611.	473.	422.	306.	9999.	9999.	446.	135.	30.29
6	9999.	9999.	306.	588.	309.	455.	514.	668.	9999.	9999.	473.	134.	28.36
7	9999.	9999.	781.	640.	643.	532.	1124.	605.	9999.	9999.	721.	195.	27.02
8	9999.	9999.	528.	745.	889.	961.	789.	1968.	9999.	9999.	980.	462.	47.14
9	9999.	9999.	1420.	985.	938.	2079.	1280.	234.	9999.	9999.	1156.	557.	48.20
10	9999.	9999.	813.	1126.	1418.	1538.	934.	9999.	9999.	9999.	1166.	276.	23.71
11	9999.	9999.	1373.	874.	1760.	1104.	1108.	9999.	9999.	9999.	1244.	303.	24.33
12	9999.	9999.	1178.	1221.	1011.	771.	1948.	9999.	9999.	9999.	1226.	394.	32.16
AVG.	9999.	9999.	704.	806.	811.	845.	896.	9999.	9999.	9999.	813.	63.	7.75
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	9999.	9999.	6169.	7064.	7105.	7404.	7851.	9999.	9999.	9999.	7119.	552.	
GJ /SQ.M.	99.99	99.99	22.21	25.43	25.58	26.66	28.26	99.99	99.99	99.99	25.63	1.99	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .0600
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .2116

Table A-VI: Monthly and Annual Wind Power Summary, Cleveland, OH

14820 CLEVELAND, OH ANEMOMETER AT 6. METERS (20. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	110.	121.	157.	164.	173.	115.	153.	202.	142.	182.	152.	29.	18.89
2	83.	153.	126.	256.	179.	171.	124.	193.	130.	58.	147.	54.	36.40
3	209.	204.	176.	118.	226.	123.	176.	140.	169.	191.	173.	35.	19.95
4	84.	145.	154.	159.	145.	239.	156.	141.	123.	156.	154.	38.	24.59
5	78.	134.	132.	148.	71.	149.	112.	115.	128.	110.	118.	25.	21.26
6	36.	65.	96.	111.	65.	94.	87.	75.	53.	79.	76.	21.	27.66
7	52.	76.	78.	78.	54.	56.	63.	67.	76.	49.	65.	11.	17.11
8	82.	61.	49.	55.	40.	51.	51.	45.	67.	66.	57.	12.	20.75
9	73.	61.	73.	90.	57.	46.	64.	74.	54.	69.	66.	12.	17.76
10	116.	81.	84.	123.	72.	73.	104.	80.	61.	74.	87.	19.	22.44
11	198.	164.	194.	191.	131.	139.	141.	85.	119.	92.	145.	39.	26.69
12	139.	149.	227.	135.	83.	209.	163.	117.	96.	126.	144.	43.	30.00
AVG.	105.	121.	129.	136.	108.	122.	116.	111.	101.	104.	115.	11.	9.38
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	919.	1061.	1129.	1188.	947.	1069.	1018.	973.	888.	912.	1010.	95.	
GJ /SQ.M.	3.31	3.82	4.06	4.28	3.41	3.85	3.66	3.50	3.20	3.28	3.64	.34	

14820 CLEVELAND, OH ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	139.	151.	193.	201.	212.	142.	189.	249.	175.	226.	188.	35.	18.42
2	105.	190.	157.	312.	219.	210.	155.	237.	160.	74.	182.	64.	35.41
3	259.	251.	216.	147.	279.	154.	218.	175.	209.	237.	215.	42.	19.66
4	107.	228.	192.	196.	180.	296.	194.	176.	153.	194.	192.	46.	24.11
5	99.	166.	164.	183.	90.	184.	140.	144.	161.	139.	147.	30.	20.70
6	47.	83.	120.	137.	82.	119.	109.	96.	67.	99.	96.	26.	26.71
7	68.	96.	98.	98.	68.	72.	81.	86.	96.	62.	83.	13.	16.20
8	104.	78.	62.	70.	53.	65.	66.	58.	85.	83.	72.	15.	20.28
9	93.	78.	92.	112.	73.	60.	81.	92.	68.	87.	84.	14.	16.97
10	147.	101.	106.	152.	92.	92.	130.	101.	76.	93.	109.	24.	22.01
11	246.	202.	239.	235.	161.	172.	176.	106.	149.	115.	180.	47.	26.33
12	174.	183.	277.	167.	105.	257.	201.	145.	121.	157.	179.	52.	29.00
AVG.	132.	151.	160.	168.	135.	152.	145.	139.	127.	131.	144.	13.	8.91
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1160.	1320.	1399.	1468.	1178.	1331.	1270.	1215.	1110.	1143.	1259.	112.	
GJ /SQ.M.	4.18	4.75	5.04	5.28	4.24	4.79	4.57	4.38	4.00	4.12	4.53	.40	

14820 CLEVELAND, OH ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	165.	204.	263.	272.	288.	190.	254.	335.	237.	303.	253.	47.	18.58
2	140.	254.	210.	429.	300.	285.	206.	322.	217.	96.	246.	90.	36.70
3	350.	341.	295.	199.	377.	205.	294.	233.	281.	319.	289.	58.	19.97
4	143.	309.	256.	265.	242.	399.	259.	234.	203.	260.	257.	63.	24.54
5	130.	223.	220.	248.	118.	248.	186.	191.	213.	184.	196.	42.	21.44
6	60.	107.	158.	185.	108.	156.	144.	124.	87.	130.	126.	35.	27.93
7	87.	125.	130.	130.	88.	93.	103.	111.	127.	80.	107.	19.	17.33
8	137.	101.	80.	90.	66.	83.	84.	74.	112.	108.	94.	20.	21.35
9	122.	101.	121.	150.	94.	76.	106.	123.	89.	114.	110.	20.	18.21
10	196.	132.	140.	205.	119.	121.	171.	132.	101.	121.	144.	33.	23.03
11	331.	274.	323.	319.	218.	232.	234.	140.	199.	152.	242.	65.	26.94
12	233.	250.	383.	227.	138.	349.	271.	193.	159.	208.	241.	73.	30.42
AVG.	176.	202.	215.	227.	180.	203.	193.	184.	169.	173.	192.	18.	9.48
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1543.	1766.	1882.	1986.	1574.	1780.	1690.	1614.	1478.	1515.	1683.	160.	
GJ /SQ.M.	5.55	6.36	6.78	7.15	5.67	6.41	6.08	5.81	5.32	5.45	6.06	.57	

14820 CLEVELAND, OH ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	272.	302.	394.	411.	431.	285.	380.	500.	353.	451.	378.	71.	18.82
2	207.	383.	317.	638.	448.	423.	309.	478.	321.	145.	367.	134.	36.44
3	518.	508.	440.	297.	562.	307.	440.	349.	418.	473.	431.	85.	19.81
4	209.	462.	385.	396.	363.	595.	388.	350.	305.	387.	384.	94.	24.56
5	193.	335.	331.	371.	180.	370.	280.	285.	318.	274.	294.	63.	21.31
6	89.	164.	240.	278.	164.	235.	216.	188.	131.	195.	190.	53.	27.83
7	128.	190.	196.	197.	134.	140.	157.	168.	190.	121.	162.	29.	17.59
8	204.	153.	122.	138.	102.	126.	126.	111.	166.	163.	141.	29.	20.61
9	180.	154.	184.	225.	142.	115.	160.	184.	134.	171.	165.	30.	17.95
10	290.	202.	212.	308.	181.	182.	259.	199.	150.	183.	217.	49.	22.66
11	491.	412.	483.	476.	325.	345.	352.	210.	297.	228.	362.	97.	26.78
12	344.	374.	570.	340.	209.	518.	406.	290.	239.	313.	360.	108.	30.00
AVG.	261.	303.	323.	340.	270.	303.	289.	276.	252.	259.	288.	28.	9.68
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2282.	2657.	2829.	2976.	2366.	2657.	2536.	2418.	2207.	2267.	2519.	244.	
GJ /SQ.M.	8.22	9.57	10.18	10.71	8.52	9.57	9.13	8.70	7.94	8.16	9.07	.88	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .2462
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .3203

Table A-VII: Monthly and Annual Wind Power Summary, Fargo, ND

14914 FARGO, ND ANEMOMETER AT 6. METERS (20. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	88.	196.	133.	142.	86.	118.	145.	224.	171.	145.	144.	40.	27.93
2	133.	71.	143.	139.	96.	123.	117.	181.	187.	184.	137.	37.	26.63
3	127.	136.	176.	85.	106.	115.	167.	201.	214.	207.	153.	44.	28.35
4	209.	269.	166.	162.	139.	204.	261.	194.	209.	287.	210.	46.	22.13
5	191.	127.	132.	107.	175.	126.	97.	90.	174.	202.	142.	38.	26.86
6	87.	122.	124.	53.	116.	138.	81.	54.	109.	105.	99.	28.	28.06
7	91.	43.	69.	41.	100.	79.	51.	42.	80.	67.	66.	20.	30.66
8	97.	56.	77.	48.	110.	128.	88.	81.	83.	118.	89.	24.	27.36
9	126.	97.	123.	106.	141.	90.	178.	80.	103.	144.	119.	28.	23.73
10	158.	251.	109.	93.	167.	125.	215.	113.	85.	136.	145.	51.	35.01
11	237.	299.	161.	213.	176.	211.	190.	154.	116.	78.	184.	59.	32.20
12	187.	153.	173.	187.	86.	122.	190.	219.	158.	113.	159.	39.	24.55
AVG.	144.	151.	132.	115.	125.	132.	148.	136.	141.	149.	137.	11.	8.05

ANNUAL NET AVAILABLE WIND ENERGY

KWHR/SQ.M.	1264.	1320.	1159.	1005.	1093.	1153.	1299.	1193.	1232.	1303.	1202.	97.	
GJ /SQ.M.	4.55	4.75	4.17	3.62	3.94	4.15	4.68	4.30	4.44	4.69	4.33	.35	

14914 FARGO, ND ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	109.	233.	165.	176.	109.	148.	181.	277.	210.	179.	179.	49.	27.63
2	165.	89.	178.	172.	120.	154.	145.	225.	230.	228.	171.	45.	26.18
3	158.	169.	219.	106.	133.	142.	206.	249.	263.	253.	190.	53.	27.80
4	258.	333.	206.	203.	175.	252.	323.	239.	257.	355.	260.	57.	21.86
5	238.	158.	165.	134.	218.	157.	120.	114.	214.	247.	177.	47.	26.40
6	110.	152.	154.	68.	144.	170.	102.	68.	136.	130.	123.	34.	27.32
7	115.	54.	89.	52.	125.	100.	65.	54.	101.	84.	84.	25.	30.14
8	121.	72.	96.	62.	137.	158.	110.	102.	104.	147.	111.	29.	26.55
9	158.	121.	152.	133.	174.	114.	219.	100.	129.	178.	148.	34.	23.01
10	196.	310.	136.	117.	209.	156.	263.	140.	108.	168.	180.	62.	34.26
11	294.	371.	202.	264.	218.	262.	236.	190.	143.	99.	228.	73.	32.11
12	233.	190.	216.	232.	109.	152.	233.	269.	195.	140.	197.	47.	24.06
AVG.	180.	188.	165.	143.	156.	164.	184.	169.	174.	184.	171.	13.	7.81

ANNUAL NET AVAILABLE WIND ENERGY

KWHR/SQ.M.	1574.	1643.	1444.	1255.	1366.	1434.	1608.	1479.	1525.	1612.	1494.	117.	
GJ /SQ.M.	5.67	5.92	5.20	4.52	4.92	5.16	5.79	5.33	5.49	5.80	5.38	.42	

14914 FARGO, ND ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	148.	309.	222.	237.	143.	198.	243.	373.	284.	242.	240.	67.	27.85
2	224.	117.	237.	232.	160.	207.	197.	303.	312.	305.	229.	61.	26.55
3	210.	229.	296.	142.	178.	193.	279.	334.	357.	347.	256.	73.	28.27
4	350.	451.	278.	271.	230.	344.	437.	324.	347.	477.	351.	78.	22.17
5	319.	213.	221.	182.	294.	210.	161.	149.	290.	336.	238.	64.	26.80
6	145.	204.	207.	88.	195.	231.	134.	89.	181.	176.	165.	47.	28.45
7	152.	70.	115.	67.	167.	132.	84.	71.	132.	111.	110.	34.	30.94
8	161.	93.	127.	79.	182.	216.	145.	135.	136.	197.	147.	41.	27.89
9	211.	161.	206.	177.	235.	150.	296.	133.	171.	241.	198.	47.	23.76
10	265.	420.	184.	155.	279.	208.	359.	187.	140.	227.	242.	85.	35.22
11	397.	498.	270.	355.	293.	353.	318.	257.	192.	128.	306.	99.	32.44
12	314.	254.	292.	313.	144.	202.	318.	366.	263.	187.	265.	66.	24.83
AVG.	241.	252.	221.	192.	208.	220.	248.	227.	234.	248.	229.	18.	8.01

ANNUAL NET AVAILABLE WIND ENERGY

KWHR/SQ.M.	2115.	2205.	1938.	1678.	1824.	1929.	2169.	1987.	2048.	2170.	2006.	161.	
GJ /SQ.M.	7.61	7.94	6.98	6.04	6.57	6.95	7.81	7.15	7.37	7.81	7.22	.58	

14914 FARGO, ND ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	220.	460.	331.	354.	214.	296.	363.	553.	426.	359.	358.	99.	27.61
2	332.	176.	354.	348.	239.	309.	293.	448.	462.	454.	342.	89.	26.19
3	315.	342.	439.	213.	267.	288.	415.	496.	530.	513.	382.	106.	27.86
4	517.	670.	414.	404.	346.	509.	651.	482.	518.	711.	522.	115.	22.06
5	475.	319.	331.	269.	438.	315.	243.	225.	430.	498.	354.	94.	26.47
6	220.	306.	310.	134.	291.	344.	202.	134.	272.	260.	247.	69.	27.98
7	229.	107.	174.	103.	251.	198.	127.	106.	200.	166.	166.	51.	30.76
8	240.	141.	192.	121.	275.	319.	219.	203.	206.	294.	221.	60.	27.13
9	315.	242.	308.	266.	351.	227.	442.	199.	257.	357.	296.	69.	23.36
10	393.	624.	274.	233.	416.	311.	531.	279.	212.	340.	361.	126.	34.78
11	589.	740.	403.	531.	438.	527.	471.	383.	287.	195.	456.	146.	32.08
12	466.	382.	432.	465.	218.	306.	470.	542.	392.	279.	395.	96.	24.21
AVG.	359.	376.	330.	287.	312.	329.	369.	338.	349.	369.	342.	27.	7.87

ANNUAL NET AVAILABLE WIND ENERGY

KWHR/SQ.M.	3149.	3291.	2892.	2511.	2733.	2882.	3233.	2958.	3060.	3231.	2994.	236.	
GJ /SQ.M.	11.34	11.85	10.41	9.04	9.84	10.38	11.64	10.65	11.01	11.63	10.78	.85	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .4120
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .3965

Table A-VIII: Monthly and Annual Wind Power Summary, Lubbock, TX

23042 LUBBOCK, TX ANEMOMETER AT 21. METERS (68. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	266.	217.	241.	229.	251.	219.	205.	289.	296.	323.	254.	37.	14.62
2	444.	458.	233.	318.	318.	411.	222.	389.	304.	332.	343.	77.	22.52
3	542.	457.	618.	191.	480.	256.	383.	552.	393.	440.	431.	125.	29.06
4	574.	474.	411.	425.	276.	364.	490.	362.	335.	477.	419.	83.	19.86
5	251.	376.	322.	165.	245.	320.	443.	466.	353.	391.	333.	89.	26.57
6	314.	252.	333.	253.	187.	268.	317.	348.	286.	305.	286.	45.	15.81
7	208.	209.	146.	212.	136.	192.	176.	151.	177.	171.	178.	26.	14.72
8	98.	106.	114.	68.	96.	141.	134.	111.	81.	155.	110.	26.	23.27
9	137.	196.	127.	116.	195.	130.	245.	124.	65.	161.	150.	48.	32.31
10	191.	223.	169.	89.	217.	165.	309.	151.	111.	153.	178.	59.	33.19
11	280.	279.	233.	185.	281.	260.	279.	148.	225.	253.	242.	43.	17.80
12	376.	253.	325.	186.	237.	253.	222.	164.	179.	204.	240.	63.	26.44
AVG.	307.	292.	273.	203.	243.	248.	285.	271.	234.	280.	264.	30.	11.21
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2687.	2555.	2389.	1780.	2131.	2175.	2500.	2375.	2048.	2456.	2310.	259.	
GJ /SQ.M.	9.67	9.20	8.60	6.41	7.67	7.83	9.00	8.55	7.37	8.84	8.31	.93	

23042 LUBBOCK, TX ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	197.	161.	179.	169.	186.	162.	152.	214.	219.	239.	188.	27.	14.56
2	328.	338.	173.	236.	237.	305.	165.	288.	224.	244.	254.	57.	22.35
3	402.	339.	458.	142.	355.	190.	284.	406.	291.	325.	319.	92.	28.92
4	424.	350.	304.	316.	205.	269.	364.	268.	248.	354.	310.	61.	19.81
5	186.	280.	239.	123.	181.	238.	329.	347.	262.	289.	247.	66.	26.57
6	233.	187.	246.	187.	139.	200.	234.	257.	211.	225.	212.	33.	15.67
7	154.	156.	109.	157.	101.	141.	129.	112.	131.	126.	132.	19.	14.64
8	73.	79.	85.	49.	71.	106.	100.	82.	60.	115.	82.	19.	23.70
9	102.	146.	94.	86.	145.	96.	183.	92.	48.	120.	111.	36.	32.64
10	142.	165.	126.	66.	161.	122.	229.	111.	82.	112.	132.	44.	33.27
11	208.	206.	174.	135.	208.	192.	207.	110.	167.	187.	179.	32.	17.92
12	279.	187.	239.	138.	176.	187.	165.	121.	133.	150.	177.	47.	26.41
AVG.	227.	216.	202.	150.	180.	184.	212.	201.	173.	207.	195.	22.	11.23
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1991.	1893.	1771.	1317.	1581.	1612.	1854.	1757.	1515.	1815.	1711.	192.	
GJ /SQ.M.	7.17	6.82	6.38	4.74	5.69	5.80	6.67	6.33	5.45	6.53	6.16	.69	

23042 LUBBOCK, TX ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	266.	217.	241.	229.	251.	219.	205.	289.	296.	323.	254.	37.	14.62
2	444.	458.	233.	318.	318.	411.	222.	389.	304.	332.	343.	77.	22.52
3	542.	457.	618.	191.	480.	256.	383.	552.	393.	440.	431.	125.	29.06
4	574.	474.	411.	425.	276.	364.	490.	362.	335.	477.	419.	83.	19.86
5	251.	376.	322.	165.	245.	320.	443.	466.	353.	391.	333.	89.	26.57
6	314.	252.	333.	253.	187.	268.	317.	348.	286.	305.	286.	45.	15.81
7	208.	209.	146.	212.	136.	192.	176.	151.	177.	171.	178.	26.	14.72
8	98.	106.	114.	68.	96.	141.	134.	111.	81.	155.	110.	26.	23.27
9	137.	196.	127.	116.	195.	130.	245.	124.	65.	161.	150.	48.	32.31
10	191.	223.	169.	89.	217.	165.	309.	151.	111.	153.	178.	59.	33.19
11	280.	279.	233.	185.	281.	260.	279.	148.	225.	253.	242.	43.	17.80
12	376.	253.	325.	186.	237.	253.	222.	164.	179.	204.	240.	63.	26.44
AVG.	307.	292.	273.	203.	243.	248.	285.	271.	234.	280.	264.	30.	11.21
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2687.	2555.	2389.	1780.	2131.	2175.	2500.	2375.	2048.	2456.	2310.	259.	
GJ /SQ.M.	9.67	9.20	8.60	6.41	7.67	7.83	9.00	8.55	7.37	8.84	8.31	.93	

23042 LUBBOCK, TX ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	386.	314.	351.	333.	365.	318.	297.	418.	429.	470.	368.	54.	14.63
2	645.	665.	338.	462.	461.	597.	324.	565.	441.	482.	498.	112.	22.50
3	785.	662.	899.	278.	697.	372.	558.	802.	570.	638.	626.	182.	29.06
4	836.	689.	599.	621.	402.	530.	713.	525.	489.	695.	610.	121.	19.87
5	365.	549.	469.	240.	355.	465.	645.	678.	515.	570.	485.	129.	26.63
6	453.	368.	484.	369.	273.	391.	460.	507.	415.	444.	416.	65.	15.71
7	303.	305.	213.	309.	197.	278.	255.	219.	257.	247.	258.	38.	14.79
8	142.	154.	165.	98.	139.	205.	194.	160.	117.	225.	160.	37.	23.40
9	199.	284.	185.	168.	284.	188.	355.	179.	95.	234.	217.	70.	32.36
10	278.	324.	245.	130.	315.	239.	449.	219.	161.	223.	258.	86.	33.16
11	408.	407.	339.	269.	408.	377.	403.	215.	326.	369.	352.	63.	17.82
12	547.	367.	473.	270.	344.	367.	323.	237.	259.	297.	348.	92.	26.47
AVG.	446.	424.	397.	296.	353.	361.	415.	394.	340.	408.	383.	43.	11.20
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	3903.	3714.	3474.	2590.	3095.	3159.	3632.	3449.	2975.	3572.	3356.	376.	
GJ /SQ.M.	14.05	13.37	12.51	9.32	11.14	11.37	13.08	12.42	10.71	12.86	12.08	1.35	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .1989
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .1989

Table A-IX: Monthly and Annual Wind Power Summary, Oklahoma City, OK

13919 OKLAHOMA CITY, OK ANEMOMETER AT 4. METERS (13. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	114.	172.	151.	195.	205.	65.	161.	112.	135.	121.	143.	40.	28.06
2	122.	177.	122.	132.	226.	63.	188.	134.	137.	147.	145.	42.	29.00
3	238.	174.	189.	168.	294.	230.	171.	210.	117.	122.	191.	51.	26.72
4	247.	154.	197.	241.	169.	147.	159.	188.	160.	145.	181.	35.	19.55
5	153.	312.	110.	121.	192.	95.	89.	101.	69.	147.	139.	67.	48.23
6	117.	75.	80.	126.	114.	128.	122.	135.	150.	100.	115.	22.	19.49
7	191.	61.	95.	68.	83.	41.	44.	105.	74.	65.	83.	41.	49.33
8	131.	59.	56.	97.	83.	43.	54.	114.	50.	60.	75.	28.	37.95
9	137.	89.	50.	68.	113.	30.	63.	100.	66.	104.	82.	31.	37.37
10	41.	75.	79.	73.	83.	130.	194.	157.	106.	103.	109.	38.	34.65
11	143.	89.	113.	118.	96.	154.	67.	152.	128.	196.	126.	36.	28.33
12	124.	81.	68.	204.	119.	91.	157.	179.	116.	122.	126.	41.	32.28
AVG.	151.	126.	109.	134.	148.	101.	122.	140.	109.	119.	126.	16.	12.79
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1319.	1107.	957.	1177.	1299.	889.	1072.	1231.	955.	1046.	1105.	141.	
GJ /SQ.M.	4.75	3.99	3.44	4.24	4.68	3.20	3.86	4.43	3.44	3.77	3.98	.51	

13919 OKLAHOMA CITY, OK ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	170.	257.	226.	292.	307.	97.	240.	166.	202.	181.	214.	60.	28.27
2	181.	264.	182.	197.	338.	93.	279.	200.	205.	221.	216.	63.	29.05
3	357.	260.	282.	251.	440.	344.	255.	312.	174.	184.	286.	77.	26.77
4	370.	230.	296.	360.	253.	219.	238.	281.	241.	217.	270.	53.	19.52
5	227.	466.	164.	182.	287.	141.	132.	150.	103.	219.	207.	100.	48.39
6	173.	112.	120.	188.	170.	191.	182.	201.	224.	149.	171.	33.	19.45
7	285.	91.	142.	101.	123.	61.	65.	157.	110.	96.	123.	61.	49.65
8	195.	87.	83.	145.	124.	65.	81.	171.	74.	89.	111.	43.	38.23
9	204.	132.	74.	102.	168.	44.	94.	150.	99.	154.	122.	46.	37.35
10	136.	112.	118.	110.	125.	193.	291.	235.	159.	154.	163.	57.	34.75
11	214.	134.	169.	176.	144.	231.	99.	227.	191.	291.	188.	53.	28.12
12	186.	121.	101.	305.	178.	137.	234.	269.	173.	182.	189.	61.	32.41
AVG.	225.	189.	163.	201.	222.	151.	182.	210.	163.	178.	188.	24.	12.85
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1969.	1654.	1429.	1759.	1941.	1325.	1599.	1840.	1427.	1559.	1650.	212.	
GJ /SQ.M.	7.09	5.96	5.14	6.33	6.99	4.77	5.75	6.62	5.14	5.61	5.94	.76	

13919 OKLAHOMA CITY, OK ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	229.	347.	303.	391.	411.	132.	323.	224.	271.	243.	287.	81.	28.07
2	244.	354.	245.	265.	453.	128.	376.	270.	277.	295.	291.	84.	28.74
3	477.	348.	379.	337.	589.	463.	343.	421.	234.	247.	384.	102.	26.64
4	495.	306.	395.	485.	340.	296.	320.	378.	323.	292.	363.	71.	19.53
5	307.	624.	221.	245.	384.	191.	180.	203.	139.	295.	279.	134.	47.94
6	235.	152.	162.	254.	230.	257.	246.	271.	302.	201.	231.	45.	19.44
7	383.	122.	192.	138.	167.	83.	90.	212.	149.	132.	167.	82.	48.91
8	263.	119.	113.	197.	168.	88.	110.	230.	101.	123.	151.	57.	37.73
9	276.	179.	101.	137.	228.	60.	126.	202.	134.	209.	165.	62.	37.38
10	183.	151.	159.	147.	169.	262.	389.	315.	212.	208.	219.	76.	34.55
11	288.	178.	227.	235.	195.	309.	135.	305.	256.	392.	252.	71.	28.22
12	250.	163.	136.	407.	241.	184.	315.	360.	234.	247.	254.	81.	32.08
AVG.	302.	253.	219.	270.	298.	204.	246.	283.	219.	240.	254.	32.	12.74
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2649.	2220.	1922.	2364.	2609.	1791.	2155.	2475.	1922.	2106.	2221.	283.	
GJ /SQ.M.	9.54	7.99	6.92	8.51	9.39	6.45	7.76	8.91	6.92	7.58	8.00	1.02	

13919 OKLAHOMA CITY, OK ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	338.	511.	446.	579.	609.	192.	477.	332.	400.	358.	424.	120.	28.29
2	360.	527.	361.	390.	670.	184.	556.	394.	405.	436.	428.	125.	29.18
3	705.	514.	560.	499.	872.	681.	507.	621.	347.	364.	567.	151.	26.68
4	733.	456.	583.	714.	503.	435.	472.	556.	476.	430.	536.	105.	19.55
5	453.	928.	326.	361.	568.	280.	263.	297.	202.	436.	411.	200.	48.61
6	344.	222.	236.	373.	337.	380.	362.	399.	444.	296.	339.	66.	19.55
7	565.	179.	280.	199.	245.	118.	128.	312.	216.	190.	243.	122.	49.99
8	387.	171.	164.	287.	245.	126.	160.	335.	146.	176.	220.	85.	38.49
9	406.	265.	146.	200.	334.	87.	186.	295.	195.	304.	242.	91.	37.67
10	268.	223.	234.	217.	245.	385.	575.	467.	312.	308.	323.	113.	34.82
11	426.	262.	334.	348.	285.	456.	197.	449.	378.	578.	371.	105.	28.34
12	366.	239.	201.	604.	356.	271.	466.	531.	343.	363.	374.	121.	32.31
AVG.	446.	375.	323.	397.	439.	300.	362.	416.	322.	353.	373.	48.	12.88
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	3907.	3283.	2827.	3482.	3845.	2624.	3174.	3640.	2821.	3094.	3270.	421.	
GJ /SQ.M.	14.06	11.82	10.18	12.53	13.84	9.45	11.43	13.11	10.16	11.14	11.77	1.52	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .1366
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = -.2520

Table A-X: Monthly and Annual Wind Power Summary, Cheyenne, WY

24018 CHEYENNE, WY ANEMOMETER AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	267.	247.	311.	298.	410.	323.	411.	390.	426.	609.	369.	100.	27.21
2	439.	316.	377.	314.	280.	427.	432.	290.	418.	572.	386.	85.	22.09
3	540.	577.	412.	193.	565.	439.	350.	294.	339.	378.	408.	118.	28.97
4	483.	292.	313.	549.	460.	392.	434.	272.	311.	533.	404.	98.	24.19
5	293.	215.	264.	158.	240.	228.	239.	266.	197.	273.	237.	38.	15.96
6	203.	196.	192.	187.	153.	239.	129.	112.	133.	206.	175.	39.	22.19
7	103.	136.	121.	131.	155.	134.	144.	102.	155.	125.	130.	18.	13.63
8	90.	143.	139.	156.	137.	206.	116.	134.	115.	206.	144.	36.	24.67
9	105.	170.	148.	176.	159.	144.	197.	129.	116.	205.	155.	31.	20.28
10	323.	237.	99.	281.	268.	167.	284.	220.	121.	175.	217.	71.	32.58
11	408.	639.	266.	471.	550.	470.	283.	338.	185.	335.	394.	132.	33.59
12	433.	433.	641.	379.	359.	323.	441.	299.	302.	538.	415.	103.	24.89
AVG.	307.	300.	273.	274.	311.	291.	288.	237.	235.	346.	286.	32.	11.19
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2691.	2628.	2394.	2403.	2726.	2550.	2525.	2077.	2056.	3033.	2508.	281.	
GJ /SQ.M.	9.69	9.46	8.62	8.65	9.81	9.18	9.09	7.48	7.40	10.92	9.03	1.01	

24018 CHEYENNE, WY ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	267.	247.	311.	298.	410.	323.	411.	390.	426.	609.	369.	100.	27.21
2	439.	316.	377.	314.	280.	427.	432.	290.	418.	572.	386.	85.	22.09
3	540.	577.	412.	193.	565.	439.	350.	294.	339.	378.	408.	118.	28.97
4	483.	292.	313.	549.	460.	392.	434.	272.	311.	533.	404.	98.	24.19
5	293.	215.	264.	158.	240.	228.	239.	266.	197.	273.	237.	38.	15.96
6	203.	196.	192.	187.	153.	239.	129.	112.	133.	206.	175.	39.	22.19
7	103.	136.	121.	131.	155.	134.	144.	102.	155.	125.	130.	18.	13.63
8	90.	143.	139.	156.	137.	206.	116.	134.	115.	206.	144.	36.	24.67
9	105.	170.	148.	176.	159.	144.	197.	129.	116.	205.	155.	31.	20.28
10	323.	237.	99.	281.	268.	167.	284.	220.	121.	175.	217.	71.	32.58
11	408.	639.	266.	471.	550.	470.	283.	338.	185.	335.	394.	132.	33.59
12	433.	433.	641.	379.	359.	323.	441.	299.	302.	538.	415.	103.	24.89
AVG.	307.	300.	273.	274.	311.	291.	288.	237.	235.	346.	286.	32.	11.19
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2691.	2628.	2394.	2403.	2726.	2550.	2525.	2077.	2056.	3033.	2508.	281.	
GJ /SQ.M.	9.69	9.46	8.62	8.65	9.81	9.18	9.09	7.48	7.40	10.92	9.03	1.01	

24018 CHEYENNE, WY ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	359.	331.	417.	398.	551.	432.	550.	522.	570.	816.	495.	134.	27.15
2	590.	422.	506.	422.	377.	575.	581.	389.	562.	768.	519.	115.	22.13
3	726.	775.	551.	259.	757.	590.	469.	394.	455.	508.	548.	159.	28.97
4	646.	392.	418.	739.	617.	528.	582.	365.	418.	718.	542.	131.	24.23
5	394.	290.	352.	213.	323.	307.	320.	358.	266.	366.	319.	51.	15.88
6	272.	263.	258.	251.	207.	320.	174.	151.	179.	276.	235.	51.	21.90
7	138.	183.	160.	176.	208.	180.	193.	137.	210.	169.	175.	24.	13.71
8	120.	191.	186.	209.	184.	279.	156.	180.	155.	275.	194.	48.	24.65
9	141.	228.	197.	237.	214.	194.	265.	174.	155.	275.	208.	42.	20.20
10	433.	317.	133.	377.	360.	224.	381.	296.	162.	234.	292.	95.	32.59
11	546.	856.	357.	634.	739.	633.	382.	455.	249.	451.	530.	177.	33.45
12	582.	579.	859.	507.	484.	433.	589.	401.	406.	723.	556.	138.	24.86
AVG.	412.	402.	366.	369.	418.	391.	387.	319.	316.	465.	385.	43.	11.17
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	3612.	3525.	3208.	3229.	3665.	3428.	3390.	2791.	2764.	4074.	3369.	376.	
GJ /SQ.M.	13.00	12.69	11.55	11.62	13.19	12.34	12.20	10.05	9.95	14.67	12.13	1.35	

24018 CHEYENNE, WY ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	527.	488.	619.	592.	816.	644.	817.	776.	846.	1212.	734.	200.	27.30
2	866.	624.	746.	624.	558.	849.	857.	575.	831.	1137.	767.	169.	22.10
3	1070.	1139.	815.	384.	1122.	873.	694.	585.	676.	750.	811.	233.	28.77
4	955.	578.	620.	1090.	913.	780.	863.	541.	617.	1061.	802.	194.	24.18
5	584.	425.	525.	318.	479.	456.	474.	531.	394.	545.	473.	75.	15.88
6	402.	389.	382.	374.	304.	478.	258.	225.	266.	410.	349.	77.	22.00
7	205.	270.	240.	261.	310.	269.	288.	203.	310.	251.	261.	36.	13.70
8	180.	284.	278.	312.	275.	413.	233.	268.	231.	411.	288.	71.	24.50
9	209.	340.	294.	351.	317.	290.	395.	258.	231.	409.	309.	63.	20.27
10	639.	471.	197.	562.	533.	335.	568.	441.	243.	350.	434.	140.	32.36
11	809.	1271.	528.	938.	1091.	937.	564.	674.	370.	667.	785.	263.	33.49
12	854.	859.	1270.	753.	712.	642.	877.	594.	601.	1070.	823.	204.	24.83
AVG.	608.	595.	543.	547.	619.	580.	574.	473.	468.	689.	570.	63.	11.11
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	5329.	5212.	4756.	4789.	5424.	5085.	5029.	4140.	4100.	6039.	4990.	554.	
GJ /SQ.M.	19.18	18.76	17.12	17.24	19.53	18.31	18.10	14.90	14.76	21.74	17.96	2.00	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .0601
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = -.0658

Table A-XI: Monthly and Annual Wind Power Summary, Great Falls, MT

24143 GREAT FALLS, MT ANEMOMETER AT 7. METERS (23. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	310.	198.	269.	417.	312.	100.	342.	431.	435.	480.	329.	112.	34.11
2	313.	470.	347.	142.	108.	126.	359.	173.	303.	450.	279.	127.	45.42
3	438.	464.	192.	78.	92.	100.	257.	104.	259.	423.	241.	146.	60.50
4	195.	148.	154.	253.	104.	243.	221.	139.	203.	304.	197.	58.	29.53
5	184.	98.	96.	107.	58.	117.	85.	137.	122.	256.	126.	54.	42.47
6	114.	216.	141.	111.	38.	157.	71.	66.	125.	108.	115.	48.	41.75
7	111.	96.	160.	73.	44.	55.	67.	61.	150.	93.	91.	37.	41.12
8	88.	136.	81.	132.	109.	123.	43.	148.	72.	163.	110.	36.	32.81
9	113.	180.	124.	319.	130.	146.	143.	129.	109.	179.	157.	59.	37.35
10	229.	285.	135.	222.	141.	227.	214.	220.	217.	264.	215.	44.	20.57
11	221.	389.	377.	458.	265.	311.	225.	376.	376.	172.	317.	88.	27.75
12	207.	620.	600.	416.	199.	193.	247.	368.	323.	146.	332.	161.	48.41
AVG.	210.	275.	223.	227.	133.	158.	189.	196.	225.	253.	209.	40.	19.11
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1841.	2410.	1954.	1993.	1169.	1385.	1660.	1717.	1967.	2218.	1831.	350.	
GJ /SQ.M.	6.63	8.68	7.03	7.17	4.21	4.99	5.97	6.18	7.08	7.98	6.59	1.26	

24143 GREAT FALLS, MT ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	364.	231.	313.	487.	365.	118.	398.	500.	508.	560.	384.	131.	33.96
2	366.	545.	404.	166.	128.	147.	420.	202.	354.	526.	326.	148.	45.28
3	511.	541.	225.	92.	109.	118.	301.	123.	306.	493.	282.	169.	60.06
4	232.	174.	181.	296.	123.	286.	259.	164.	239.	357.	231.	68.	29.30
5	218.	115.	113.	127.	69.	140.	100.	162.	143.	301.	149.	63.	42.39
6	136.	254.	166.	130.	44.	185.	84.	79.	148.	130.	136.	56.	41.55
7	130.	113.	189.	86.	52.	65.	78.	71.	176.	109.	107.	44.	41.40
8	103.	160.	96.	157.	130.	145.	50.	174.	84.	192.	129.	43.	32.98
9	134.	211.	148.	373.	154.	169.	170.	153.	128.	212.	185.	68.	36.74
10	270.	335.	157.	262.	167.	267.	254.	259.	254.	312.	254.	52.	20.63
11	259.	455.	441.	534.	312.	364.	266.	441.	439.	204.	371.	102.	27.33
12	244.	720.	699.	484.	236.	227.	289.	428.	377.	171.	387.	186.	47.90
AVG.	247.	321.	261.	266.	157.	186.	222.	230.	263.	297.	245.	46.	18.91
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2166.	2814.	2285.	2332.	1380.	1628.	1947.	2012.	2304.	2604.	2147.	406.	
GJ /SQ.M.	7.80	10.13	8.23	8.39	4.97	5.86	7.01	7.24	8.29	9.38	7.73	1.46	

24143 GREAT FALLS, MT ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	482.	308.	419.	652.	487.	156.	540.	678.	684.	753.	516.	177.	34.34
2	490.	736.	542.	223.	169.	198.	566.	272.	474.	708.	438.	199.	45.52
3	685.	728.	297.	121.	143.	155.	404.	163.	406.	665.	377.	229.	60.75
4	305.	231.	240.	394.	162.	382.	350.	216.	317.	479.	307.	92.	29.87
5	286.	152.	148.	166.	91.	183.	134.	214.	192.	402.	197.	84.	42.79
6	177.	336.	219.	173.	60.	244.	113.	104.	197.	170.	179.	74.	41.50
7	173.	148.	250.	114.	69.	86.	104.	95.	234.	145.	142.	58.	41.23
8	136.	212.	126.	205.	171.	193.	67.	233.	112.	256.	171.	56.	33.01
9	175.	280.	193.	499.	203.	228.	224.	202.	171.	279.	246.	92.	37.38
10	354.	444.	211.	347.	220.	357.	336.	347.	341.	414.	337.	69.	20.55
11	345.	608.	592.	715.	414.	488.	353.	594.	591.	270.	497.	138.	27.69
12	323.	971.	943.	649.	314.	303.	387.	580.	506.	228.	520.	252.	48.41
AVG.	328.	430.	348.	355.	208.	248.	298.	308.	352.	398.	327.	62.	19.06
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2869.	3764.	3052.	3108.	1826.	2170.	2612.	2700.	3084.	3482.	2867.	546.	
GJ /SQ.M.	10.33	13.55	10.99	11.19	6.57	7.81	9.40	9.72	11.10	12.54	10.32	1.97	

24143 GREAT FALLS, MT ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	726.	466.	631.	975.	728.	234.	793.	996.	1007.	1109.	766.	258.	33.71
2	731.	1094.	810.	335.	256.	294.	833.	402.	703.	1042.	650.	294.	45.17
3	1020.	1084.	452.	186.	220.	232.	595.	246.	604.	982.	562.	338.	60.08
4	462.	350.	362.	592.	249.	563.	513.	323.	472.	708.	459.	133.	29.02
5	434.	233.	227.	255.	139.	272.	199.	320.	285.	595.	296.	124.	41.94
6	271.	511.	335.	262.	91.	365.	167.	157.	294.	256.	271.	113.	41.65
7	263.	227.	377.	174.	105.	130.	156.	143.	351.	218.	214.	88.	40.88
8	208.	321.	194.	314.	256.	288.	101.	345.	170.	382.	258.	84.	32.46
9	268.	424.	292.	745.	303.	338.	334.	303.	257.	417.	368.	137.	37.10
10	539.	672.	317.	522.	328.	525.	498.	513.	506.	616.	504.	104.	20.70
11	518.	911.	884.	1069.	614.	718.	522.	876.	879.	403.	739.	206.	27.80
12	486.	1444.	1396.	970.	465.	445.	571.	851.	752.	339.	772.	374.	48.43
AVG.	494.	645.	523.	533.	313.	367.	440.	456.	523.	589.	488.	94.	19.20
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	4326.	5649.	4581.	4671.	2740.	3216.	3856.	3998.	4584.	5159.	4278.	821.	
GJ /SQ.M.	15.57	20.33	16.49	16.81	9.86	11.58	13.88	14.39	16.50	18.57	15.40	2.96	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .3059
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .3920

Table A-XII: Monthly and Annual Wind Power Summary, Tatoosh Is, WA

24240 TATOOSH IS. WA ANEMOMETER AT 20. METERS (64. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	526.	764.	809.	868.	922.	890.	1458.	707.	708.	806.	846.	231.	27.30
2	550.	427.	817.	748.	601.	699.	799.	523.	1357.	378.	690.	264.	38.31
3	495.	602.	529.	318.	411.	782.	589.	528.	512.	525.	529.	115.	21.81
4	352.	227.	264.	365.	469.	685.	303.	386.	301.	295.	365.	125.	34.24
5	144.	175.	95.	182.	248.	248.	151.	186.	371.	263.	206.	74.	36.01
6	171.	176.	73.	150.	114.	181.	143.	143.	110.	115.	138.	33.	23.81
7	92.	145.	96.	232.	131.	111.	128.	136.	136.	111.	132.	37.	28.44
8	64.	94.	82.	108.	101.	130.	105.	197.	95.	114.	109.	34.	31.01
9	110.	230.	239.	215.	214.	256.	215.	134.	274.	226.	231.	54.	23.14
10	443.	329.	745.	599.	287.	485.	380.	592.	630.	781.	527.	161.	30.54
11	1235.	637.	463.	595.	718.	644.	496.	829.	770.	382.	677.	228.	33.70
12	1218.	887.	1044.	911.	573.	1018.	734.	821.	928.	795.	893.	170.	19.03
AVG.	450.	391.	438.	441.	399.	511.	459.	448.	516.	399.	445.	41.	9.20
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	3942.	3427.	3836.	3862.	3497.	4476.	4017.	3928.	4521.	3498.	3900.	359.	
GJ /SQ.M.	14.19	12.34	13.81	13.90	12.59	16.11	14.46	14.14	16.27	12.59	14.04	1.29	

24240 TATOOSH IS. WA ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	395.	573.	609.	653.	692.	669.	1097.	531.	531.	604.	635.	174.	27.39
2	413.	322.	616.	563.	452.	525.	601.	392.	1020.	286.	519.	199.	38.26
3	374.	453.	398.	240.	308.	586.	443.	396.	383.	392.	397.	86.	21.73
4	264.	171.	198.	274.	352.	513.	228.	290.	226.	223.	274.	93.	34.04
5	109.	131.	71.	138.	186.	187.	114.	140.	278.	198.	155.	56.	35.85
6	128.	133.	54.	113.	86.	136.	108.	107.	83.	87.	103.	25.	23.77
7	69.	109.	72.	177.	98.	84.	97.	103.	101.	84.	99.	29.	29.02
8	48.	71.	62.	82.	76.	97.	79.	148.	71.	86.	82.	25.	30.91
9	82.	173.	179.	160.	161.	192.	161.	251.	206.	170.	173.	40.	23.31
10	332.	248.	560.	450.	215.	365.	284.	446.	472.	585.	396.	121.	30.54
11	928.	479.	346.	446.	538.	485.	374.	623.	577.	287.	508.	171.	33.69
12	913.	670.	784.	682.	432.	767.	552.	616.	701.	600.	672.	127.	18.92
AVG.	338.	294.	329.	331.	300.	384.	345.	337.	387.	300.	335.	31.	9.16
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2959.	2578.	2882.	2903.	2626.	3362.	3020.	2950.	3394.	2629.	2931.	268.	
GJ /SQ.M.	10.65	9.28	10.38	10.45	9.45	12.10	10.87	10.62	12.22	9.47	10.55	.97	

24240 TATOOSH IS. WA ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	526.	764.	809.	868.	922.	890.	1458.	707.	708.	806.	846.	231.	27.30
2	550.	427.	817.	748.	601.	699.	799.	523.	1357.	378.	690.	264.	38.31
3	495.	602.	529.	318.	411.	782.	589.	528.	512.	525.	529.	115.	21.81
4	352.	227.	264.	365.	469.	685.	303.	386.	301.	295.	365.	125.	34.24
5	144.	175.	95.	182.	248.	248.	151.	186.	371.	263.	206.	74.	36.01
6	171.	176.	73.	150.	114.	181.	143.	143.	110.	115.	138.	33.	23.81
7	92.	145.	96.	232.	131.	111.	128.	136.	136.	111.	132.	37.	28.44
8	64.	94.	82.	108.	101.	130.	105.	197.	95.	114.	109.	34.	31.01
9	110.	230.	239.	215.	214.	256.	215.	134.	274.	226.	231.	54.	23.14
10	443.	329.	745.	599.	287.	485.	380.	592.	630.	781.	527.	161.	30.54
11	1235.	637.	463.	595.	718.	644.	496.	829.	770.	382.	677.	228.	33.70
12	1218.	887.	1044.	911.	573.	1018.	734.	821.	928.	795.	893.	170.	19.03
AVG.	450.	391.	438.	441.	399.	511.	459.	448.	516.	399.	445.	41.	9.20
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	3942.	3427.	3836.	3862.	3497.	4476.	4017.	3928.	4521.	3498.	3900.	359.	
GJ /SQ.M.	14.19	12.34	13.81	13.90	12.59	16.11	14.46	14.14	16.27	12.59	14.04	1.29	

24240 TATOOSH IS. WA ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	781.	1140.	1200.	1286.	1374.	1332.	2171.	1057.	1057.	1204.	1260.	344.	27.27
2	815.	635.	1210.	1111.	901.	1048.	1192.	781.	2025.	564.	1028.	394.	38.33
3	737.	894.	786.	472.	613.	1171.	879.	788.	767.	783.	789.	173.	21.94
4	522.	338.	390.	542.	702.	1024.	452.	576.	450.	442.	544.	187.	34.44
5	214.	258.	140.	270.	370.	371.	225.	278.	553.	393.	307.	111.	36.24
6	253.	262.	108.	223.	170.	270.	213.	213.	164.	172.	205.	49.	23.76
7	137.	215.	143.	344.	195.	166.	191.	204.	202.	166.	196.	55.	28.24
8	95.	140.	122.	161.	151.	193.	157.	295.	142.	170.	162.	51.	31.23
9	163.	342.	357.	319.	320.	382.	321.	499.	410.	338.	345.	80.	23.29
10	660.	487.	1110.	888.	429.	724.	566.	885.	941.	1170.	786.	241.	30.69
11	1837.	944.	686.	888.	1076.	961.	740.	1238.	1151.	571.	1009.	339.	33.63
12	1814.	1316.	1550.	1358.	855.	1520.	1096.	1223.	1387.	1190.	1331.	252.	18.93
AVG.	669.	581.	650.	655.	596.	763.	684.	670.	771.	597.	664.	62.	9.29
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	5860.	5089.	5695.	5737.	5224.	6687.	5990.	5866.	6752.	5229.	5813.	540.	
GJ /SQ.M.	21.10	18.32	20.50	20.65	18.80	24.07	21.56	21.12	24.31	18.82	20.93	1.94	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .2038
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = -.2841

Table A-XIII: Monthly and Annual Wind Power Summary, Enewetak, MI

41601 ENIWETOK, MARSHALLS ANEMOMETER AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	375.	408.	383.	178.	352.	284.	405.	418.	399.	760.	396.	140.	35.31
2	457.	530.	414.	234.	467.	242.	366.	306.	280.	441.	374.	98.	26.33
3	201.	486.	520.	293.	212.	226.	315.	208.	557.	752.	377.	181.	47.89
4	399.	522.	199.	197.	296.	170.	320.	261.	406.	627.	339.	142.	41.81
5	227.	488.	375.	109.	147.	223.	180.	145.	200.	650.	274.	166.	60.65
6	168.	259.	127.	82.	113.	193.	226.	143.	187.	461.	196.	102.	51.86
7	129.	179.	169.	82.	80.	338.	152.	77.	172.	9999.	153.	76.	49.74
8	93.	163.	90.	86.	53.	103.	52.	80.	80.	9999.	89.	31.	34.79
9	66.	185.	74.	68.	129.	155.	86.	141.	91.	9999.	110.	41.	36.75
10	108.	148.	106.	88.	112.	182.	65.	109.	194.	9999.	124.	40.	32.58
11	293.	195.	219.	220.	152.	312.	230.	290.	162.	9999.	231.	54.	23.54
12	426.	390.	315.	520.	248.	405.	402.	366.	292.	9999.	374.	76.	20.38
AVG.	244.	329.	249.	180.	197.	236.	233.	212.	252.	9999.	237.	40.	16.94
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2140.	2886.	2185.	1575.	1723.	2069.	2043.	1857.	2205.	9999.	2076.	352.	
GJ /SQ.M.	7.71	10.39	7.87	5.67	6.20	7.45	7.36	6.68	7.94	99.99	7.47	1.27	

41601 ENIWETOK, MARSHALLS ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	375.	408.	383.	178.	352.	284.	405.	418.	399.	760.	396.	140.	35.31
2	457.	530.	414.	234.	467.	242.	366.	306.	280.	441.	374.	98.	26.33
3	201.	486.	520.	293.	212.	226.	315.	208.	557.	752.	377.	181.	47.89
4	399.	5224	199.	197.	296.	170.	320.	261.	406.	627.	339.	142.	41.81
5	227.	488.	375.	109.	147.	223.	180.	145.	200.	650.	274.	166.	60.65
6	168.	259.	127.	82.	113.	193.	226.	143.	187.	461.	196.	102.	51.86
7	129.	179.	169.	82.	80.	338.	152.	77.	172.	9999.	153.	76.	49.74
8	93.	163.	90.	86.	53.	103.	52.	80.	80.	9999.	89.	31.	34.79
9	66.	185.	74.	68.	129.	155.	86.	141.	91.	9999.	110.	41.	36.75
10	108.	148.	106.	88.	112.	182.	65.	109.	194.	9999.	124.	40.	32.58
11	293.	195.	219.	220.	152.	312.	230.	290.	162.	9999.	231.	54.	23.54
12	426.	390.	315.	520.	248.	405.	402.	366.	292.	9999.	374.	76.	20.38
AVG.	244.	329.	249.	180.	197.	236.	233.	212.	252.	9999.	237.	40.	16.94
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2140.	2886.	2185.	1575.	1723.	2069.	2043.	1857.	2205.	9999.	2076.	352.	
GJ /SQ.M.	7.71	10.39	7.87	5.67	6.20	7.45	7.36	6.68	7.94	99.99	7.47	1.27	

41601 ENIWETOK, MARSHALLS ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	508.	548.	521.	235.	478.	383.	552.	561.	537.	1019.	534.	188.	35.14
2	610.	706.	552.	314.	625.	326.	493.	411.	379.	591.	501.	130.	25.88
3	270.	650.	696.	397.	283.	305.	422.	277.	747.	1007.	505.	241.	47.76
4	527.	698.	265.	266.	399.	225.	434.	352.	547.	834.	455.	188.	41.45
5	304.	657.	514.	145.	200.	296.	241.	196.	268.	869.	369.	223.	60.53
6	224.	349.	167.	110.	150.	258.	302.	191.	251.	623.	263.	138.	52.55
7	172.	240.	227.	109.	108.	458.	204.	102.	230.	9999.	206.	104.	50.42
8	124.	218.	120.	115.	71.	136.	69.	109.	107.	9999.	119.	41.	34.67
9	88.	247.	99.	91.	172.	208.	114.	189.	123.	9999.	148.	54.	36.81
10	145.	197.	144.	117.	151.	243.	88.	144.	262.	9999.	166.	54.	32.54
11	396.	266.	297.	296.	204.	421.	308.	388.	217.	9999.	310.	73.	23.50
12	575.	531.	422.	496.	336.	554.	546.	494.	396.	9999.	506.	102.	20.20
AVG.	328.	442.	335.	241.	265.	318.	314.	285.	339.	9999.	319.	54.	16.91
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2878.	3874.	2936.	2112.	2320.	2785.	2754.	2494.	2967.	9999.	2791.	472.	
GJ /SQ.M.	10.36	13.94	10.57	7.60	8.35	10.02	9.91	8.98	10.68	99.99	10.05	1.70	

41601 ENIWETOK, MARSHALLS ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	751.	809.	765.	362.	703.	571.	814.	833.	797.	1510.	792.	276.	34.89
2	915.	1054.	828.	471.	932.	486.	732.	615.	556.	877.	746.	194.	26.06
3	403.	971.	1042.	587.	425.	454.	627.	414.	1108.	1495.	753.	359.	47.65
4	773.	1043.	398.	391.	592.	342.	638.	525.	811.	1248.	676.	281.	41.57
5	458.	972.	751.	221.	295.	449.	364.	291.	400.	1290.	549.	329.	59.93
6	339.	521.	256.	167.	230.	389.	455.	288.	372.	918.	393.	202.	51.29
7	262.	360.	341.	165.	161.	675.	306.	154.	344.	9999.	308.	152.	49.35
8	149.	329.	183.	174.	107.	207.	104.	161.	161.	9999.	179.	62.	34.68
9	135.	372.	150.	138.	261.	311.	174.	281.	183.	9999.	223.	81.	36.37
10	217.	299.	214.	177.	223.	365.	132.	220.	384.	9999.	246.	80.	32.10
11	584.	391.	441.	443.	306.	626.	463.	581.	327.	9999.	462.	108.	23.26
12	854.	781.	633.	1038.	498.	814.	799.	728.	583.	9999.	748.	152.	20.28
AVG.	490.	658.	500.	361.	394.	474.	467.	424.	502.	9999.	475.	80.	16.81
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	4292.	5767.	4381.	3163.	3455.	4152.	4094.	3716.	4398.	9999.	4158.	699.	
GJ /SQ.M.	15.45	20.76	15.77	11.39	12.44	14.95	14.74	13.38	15.83	99.99	14.97	2.52	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .4864

YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .2504

Table A-XIV: Monthly and Annual Wind Power Summary, San Nicholas Is, CA

93116 SAN NICOLAS IS. CA ANEMOMETER AT 4. METERS (13. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	146.	39.	107.	57.	263.	139.	101.	85.	45.	72.	105.	63.	59.85
2	263.	167.	91.	144.	102.	122.	225.	84.	103.	162.	142.	49.	34.35
3	199.	343.	165.	209.	199.	140.	216.	191.	146.	279.	209.	58.	28.00
4	345.	197.	211.	233.	169.	166.	179.	172.	255.	256.	223.	66.	29.42
5	374.	468.	260.	159.	233.	326.	87.	223.	330.	140.	260.	111.	42.53
6	103.	158.	118.	150.	121.	182.	213.	239.	320.	155.	176.	63.	35.61
7	128.	47.	91.	234.	128.	164.	203.	51.	168.	114.	137.	53.	38.87
8	102.	149.	138.	77.	87.	114.	59.	89.	224.	61.	110.	48.	43.21
9	84.	75.	115.	102.	121.	140.	210.	45.	192.	69.	115.	50.	43.72
10	161.	89.	125.	77.	56.	95.	73.	40.	123.	123.	96.	35.	36.29
11	84.	106.	111.	237.	171.	111.	59.	39.	213.	40.	117.	66.	56.26
12	84.	66.	46.	103.	249.	102.	150.	122.	128.	126.	117.	53.	45.10
AVG.	173.	162.	132.	148.	158.	150.	148.	115.	187.	133.	151.	20.	13.28
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1520.	1418.	1153.	1301.	1387.	1314.	1295.	1007.	1640.	1166.	1320.	175.	
GJ /SQ.M.	5.47	5.11	4.15	4.68	4.99	4.73	4.66	3.62	5.90	4.20	4.75	.63	

93116 SAN NICOLAS IS. CA ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	217.	58.	157.	84.	393.	209.	150.	127.	67.	107.	157.	94.	60.06
2	331.	247.	133.	211.	153.	184.	336.	125.	153.	242.	211.	73.	34.47
3	294.	508.	243.	312.	296.	208.	321.	285.	218.	418.	310.	87.	27.99
4	588.	292.	310.	344.	252.	250.	266.	257.	381.	383.	332.	98.	29.51
5	554.	696.	384.	235.	348.	489.	129.	333.	491.	211.	387.	164.	42.46
6	152.	234.	174.	221.	181.	274.	320.	360.	475.	231.	262.	94.	35.88
7	192.	128.	135.	349.	191.	241.	303.	76.	250.	170.	203.	79.	38.96
8	149.	219.	205.	113.	129.	171.	87.	133.	333.	91.	163.	70.	43.13
9	122.	111.	168.	152.	180.	209.	315.	67.	285.	103.	171.	76.	44.13
10	240.	131.	186.	114.	83.	142.	109.	60.	184.	183.	143.	52.	36.45
11	123.	158.	165.	354.	256.	165.	87.	58.	317.	58.	174.	98.	56.50
12	123.	98.	67.	153.	370.	153.	224.	183.	191.	187.	175.	79.	45.10
AVG.	257.	240.	194.	220.	236.	225.	221.	172.	279.	199.	224.	30.	13.25
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2254.	2103.	1700.	1929.	2069.	1967.	1933.	1505.	2443.	1740.	1964.	260.	
GJ /SQ.M.	8.11	7.57	6.12	6.94	7.45	7.08	6.96	5.42	8.79	6.26	7.07	.94	

93116 SAN NICOLAS IS. CA ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	291.	77.	214.	113.	529.	280.	203.	172.	90.	144.	211.	127.	59.92
2	444.	333.	183.	283.	209.	246.	454.	169.	206.	325.	285.	97.	34.16
3	395.	679.	328.	417.	403.	281.	434.	384.	295.	561.	418.	115.	27.62
4	790.	390.	419.	463.	346.	336.	359.	345.	511.	517.	448.	131.	29.26
5	742.	935.	516.	314.	469.	656.	175.	448.	664.	282.	520.	221.	42.39
6	205.	313.	236.	298.	244.	369.	431.	481.	643.	312.	353.	127.	35.90
7	255.	173.	182.	472.	260.	332.	408.	103.	337.	229.	275.	107.	38.95
8	202.	295.	276.	157.	176.	230.	118.	181.	448.	123.	221.	94.	42.61
9	167.	148.	229.	205.	243.	283.	420.	91.	388.	139.	231.	101.	43.80
10	321.	177.	250.	156.	115.	192.	147.	82.	248.	248.	194.	69.	35.81
11	167.	213.	222.	475.	345.	226.	118.	78.	427.	80.	235.	132.	56.16
12	167.	132.	91.	209.	502.	206.	300.	247.	257.	254.	236.	107.	45.21
AVG.	345.	322.	262.	297.	320.	303.	297.	232.	376.	268.	302.	40.	13.16
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	3026.	2821.	2297.	2602.	2803.	2654.	2603.	2031.	3294.	2345.	2648.	349.	
GJ /SQ.M.	10.89	10.16	8.27	9.37	10.09	9.55	9.37	7.31	11.86	8.44	9.53	1.25	

93116 SAN NICOLAS IS. CA ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	431.	115.	316.	168.	771.	414.	296.	251.	132.	210.	311.	185.	59.47
2	660.	492.	268.	420.	304.	367.	666.	248.	303.	475.	420.	145.	34.39
3	966.	1010.	484.	619.	591.	415.	642.	569.	432.	829.	618.	172.	27.87
4	1168.	582.	619.	691.	500.	493.	529.	511.	760.	760.	661.	195.	29.46
5	1103.	1389.	768.	464.	689.	967.	254.	660.	975.	415.	768.	328.	42.72
6	303.	466.	348.	439.	354.	540.	632.	710.	945.	461.	520.	186.	35.84
7	377.	258.	269.	691.	377.	481.	605.	148.	497.	340.	404.	158.	38.95
8	299.	441.	410.	223.	254.	336.	172.	263.	665.	178.	324.	142.	43.78
9	247.	221.	339.	299.	359.	413.	626.	132.	570.	202.	341.	151.	44.21
10	476.	263.	369.	225.	164.	280.	216.	118.	361.	361.	283.	103.	36.39
11	245.	315.	330.	697.	509.	327.	172.	113.	629.	116.	345.	195.	56.38
12	247.	194.	134.	303.	741.	305.	445.	360.	381.	372.	348.	158.	45.39
AVG.	512.	479.	388.	437.	468.	445.	438.	340.	554.	393.	445.	59.	13.29
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	4483.	4194.	3397.	3825.	4097.	3897.	3836.	2981.	4855.	3446.	3901.	519.	
GJ /SQ.M.	16.14	15.10	12.23	13.77	14.75	14.03	13.81	10.73	17.48	12.40	14.04	1.87	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .1004
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = -.4983

Table A-XV: Monthly and Annual Wind Power Summary, Cape Hatteras, NC

93729 CAPE HATTERAS, NC ANEMOMETER AT 10. METERS (32. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	154.	187.	203.	184.	216.	184.	127.	134.	99.	160.	165.	35.	21.15
2	140.	229.	145.	168.	415.	145.	133.	119.	97.	146.	174.	87.	49.96
3	124.	113.	123.	113.	165.	114.	135.	94.	61.	109.	115.	26.	22.23
4	74.	119.	86.	119.	214.	98.	95.	95.	78.	185.	116.	44.	38.24
5	91.	96.	83.	59.	124.	150.	84.	70.	74.	68.	90.	26.	29.38
6	123.	117.	73.	120.	88.	69.	70.	52.	48.	77.	84.	26.	31.26
7	79.	244.	80.	189.	170.	107.	135.	143.	62.	91.	130.	55.	42.28
8	202.	178.	154.	66.	88.	115.	183.	134.	89.	193.	140.	47.	33.22
9	126.	96.	195.	85.	102.	235.	158.	82.	73.	186.	134.	53.	39.92
10	203.	175.	215.	152.	100.	190.	141.	78.	67.	190.	151.	51.	33.51
11	232.	154.	128.	198.	143.	82.	165.	127.	164.	154.	155.	39.	25.07
12	259.	124.	247.	262.	146.	221.	172.	208.	175.	9999.	201.	47.	23.49
AVG.	151.	153.	144.	143.	164.	142.	133.	111.	90.	9999.	137.	21.	15.64
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1319.	1336.	1264.	1251.	1439.	1247.	1167.	975.	792.	9999.	1199.	188.	
GJ /SQ.M.	4.75	4.81	4.55	4.50	5.18	4.49	4.20	3.51	2.85	99.99	4.32	.68	

93729 CAPE HATTERAS, NC ESTIMATE AT 10. METERS (33. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	154.	187.	203.	184.	216.	184.	127.	134.	99.	160.	165.	35.	21.15
2	140.	229.	145.	168.	415.	145.	133.	119.	97.	146.	174.	87.	49.96
3	124.	113.	123.	113.	165.	114.	135.	94.	61.	109.	115.	26.	22.23
4	74.	119.	86.	119.	214.	98.	95.	95.	78.	185.	116.	44.	38.24
5	91.	96.	83.	59.	124.	150.	84.	70.	74.	68.	90.	26.	29.38
6	123.	117.	73.	120.	88.	69.	70.	52.	48.	77.	84.	26.	31.26
7	79.	244.	80.	189.	170.	107.	135.	143.	62.	91.	130.	55.	42.28
8	202.	178.	154.	66.	88.	115.	183.	134.	89.	193.	140.	47.	33.22
9	126.	96.	195.	85.	102.	235.	158.	82.	73.	186.	134.	53.	39.92
10	203.	175.	215.	152.	100.	190.	141.	78.	67.	190.	151.	51.	33.51
11	232.	154.	128.	198.	143.	82.	165.	127.	164.	154.	155.	39.	25.07
12	259.	124.	247.	262.	146.	221.	172.	208.	175.	9999.	201.	47.	23.49
AVG.	151.	153.	144.	143.	164.	142.	133.	111.	90.	9999.	137.	21.	15.64
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1319.	1336.	1264.	1251.	1439.	1247.	1167.	975.	792.	9999.	1199.	188.	
GJ /SQ.M.	4.75	4.81	4.55	4.50	5.18	4.49	4.20	3.51	2.85	99.99	4.32	.68	

93729 CAPE HATTERAS, NC ESTIMATE AT 20. METERS (66. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	212.	259.	278.	255.	296.	252.	173.	184.	136.	222.	227.	48.	21.17
2	192.	314.	200.	232.	571.	200.	184.	165.	134.	204.	239.	119.	49.69
3	172.	154.	168.	154.	227.	156.	186.	130.	84.	149.	158.	35.	22.15
4	103.	164.	116.	164.	295.	134.	130.	130.	107.	254.	160.	61.	38.35
5	126.	130.	114.	81.	171.	206.	117.	96.	101.	92.	123.	36.	29.51
6	169.	162.	100.	164.	119.	95.	97.	73.	65.	105.	115.	36.	31.23
7	110.	334.	109.	259.	232.	147.	187.	197.	85.	125.	178.	75.	41.93
8	280.	248.	213.	91.	121.	157.	251.	186.	122.	266.	194.	65.	33.36
9	174.	134.	270.	116.	140.	322.	217.	113.	102.	257.	184.	73.	39.82
10	279.	241.	297.	210.	137.	263.	194.	107.	92.	263.	208.	70.	33.54
11	321.	213.	176.	274.	198.	112.	228.	174.	224.	209.	213.	54.	25.25
12	355.	172.	340.	359.	200.	305.	235.	288.	242.	9999.	277.	65.	23.36
AVG.	208.	210.	198.	197.	225.	196.	183.	153.	125.	9999.	188.	29.	15.60
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	1820.	1843.	1738.	1721.	1975.	1715.	1606.	1345.	1091.	9999.	1650.	257.	
GJ /SQ.M.	6.55	6.63	6.26	6.20	7.11	6.17	5.78	4.84	3.93	99.99	5.94	.93	

93729 CAPE HATTERAS, NC ESTIMATE AT 50. METERS (164. FEET) ABOVE SURFACE.

MONTH	YEAR 1	2	3	4	5	6	7	8	9	10	MONTHLY STATISTICS AVG.	S.D.	S.D.PCT
1	310.	376.	409.	369.	434.	368.	254.	270.	198.	322.	331.	70.	21.25
2	281.	461.	290.	339.	835.	291.	267.	239.	197.	293.	349.	175.	50.04
3	249.	227.	248.	226.	333.	227.	271.	190.	123.	218.	231.	51.	22.18
4	149.	240.	173.	239.	428.	196.	190.	190.	156.	372.	233.	89.	38.07
5	185.	194.	168.	120.	250.	302.	171.	141.	149.	138.	182.	53.	29.19
6	246.	236.	149.	242.	177.	140.	142.	105.	96.	156.	169.	52.	31.03
7	159.	492.	161.	381.	339.	213.	273.	290.	124.	180.	261.	111.	42.43
8	406.	358.	311.	133.	177.	232.	368.	269.	178.	392.	282.	94.	33.25
9	253.	193.	391.	171.	206.	472.	317.	164.	148.	376.	269.	107.	39.79
10	409.	351.	432.	305.	201.	381.	285.	157.	136.	381.	304.	101.	33.36
11	466.	310.	257.	399.	288.	164.	331.	256.	331.	309.	311.	78.	25.06
12	520.	248.	497.	526.	292.	446.	345.	420.	352.	9999.	405.	96.	23.60
AVG.	303.	307.	291.	288.	330.	286.	268.	224.	182.	9999.	275.	43.	15.57
ANNUAL NET AVAILABLE WIND ENERGY													
KWHR/SQ.M.	2653.	2691.	2545.	2519.	2891.	2505.	2346.	1965.	1598.	9999.	2413.	376.	
GJ /SQ.M.	9.55	9.69	9.16	9.07	10.41	9.02	8.44	7.07	5.75	99.99	8.69	1.35	

MONTH-TO-MONTH CORRELATION COEFFICIENT FOR WIND POWER = .3258
YEAR-TO-YEAR CORRELATION COEFFICIENT FOR WIND POWER = .5325

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