

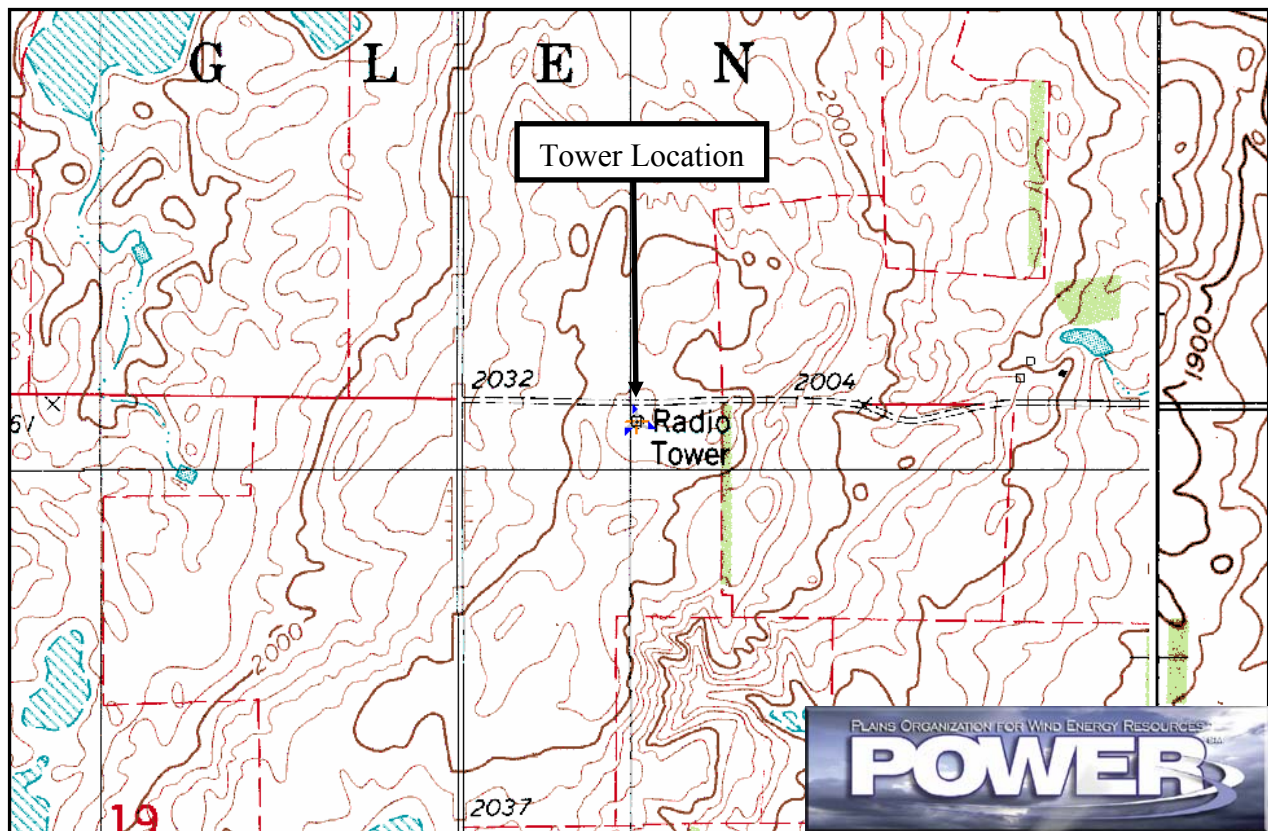
Wind Resource Summary for Alfred Site

North Dakota Utility Study
 Falls^a 1994, 1995, 1996 & 1997

Site Description:

Latitude: N 46° 35' 14"	Township: 136 N
Longitude: W 99° 0' 48"	Range: 66 W
Elevation: 2070 feet	Section: 20
Tower Type: Lattice Tower	Tower Height: 160 feet

The monitoring site was 6.7 miles southeast of the town of Gackle, North Dakota. An existing tower was used and instrumented at three levels: 33 ft (10 m), 82 ft (25 m), and 131 ft (40 m). The tower was located on a ridge with good wind exposure; however, an 1100-ft long, north-to-south windbreak was located 530 ft east of the tower.



Summary Wind Data:	33 ft AGL ^b	82 ft AGL	131 ft AGL
Mean Wind Speed	14.2 mph	17.0 mph	18.4 mph
Maximum, 60-min Mean Wind Speed	52.0 mph at 131 ft AGL – 10/29/1996 10:00 p.m.		
Estimated Wind Power Class ^c	Class 6 (558 W/m ² at 131 ft AGL)		

^a Fall is defined as the months of September, October, and November. Fall 1994 begins with September 1994.

Data recovery rates at 33, 82, and 131 feet were 73%, 65%, and 88%, respectively.

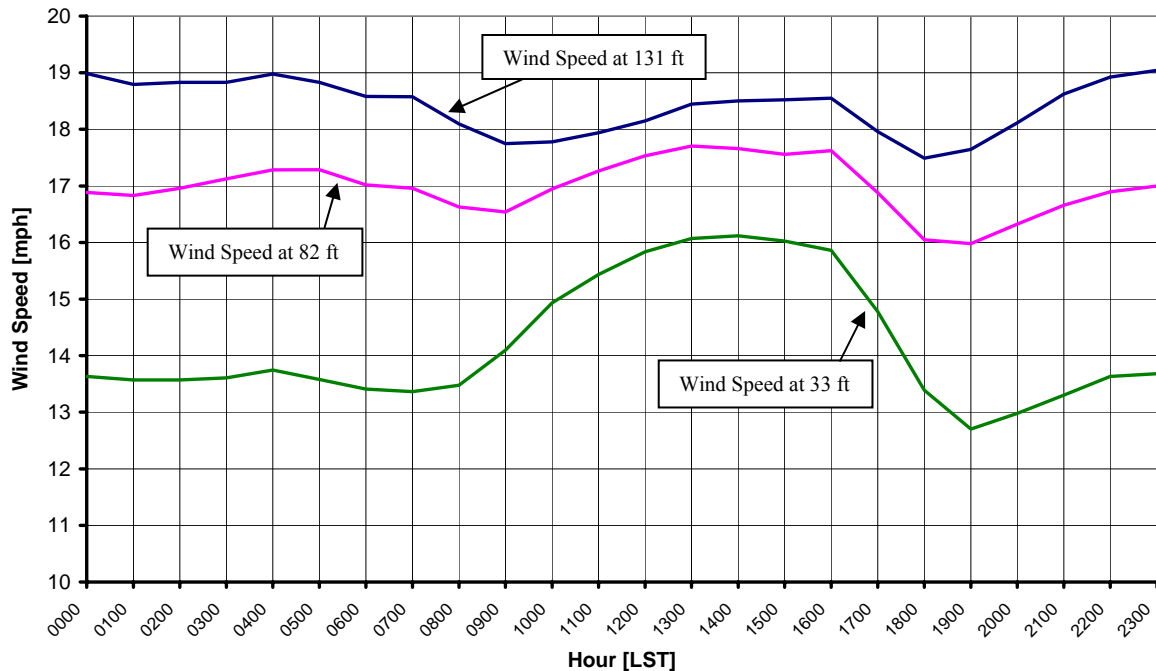
^b Above ground level.

^c Air temperature was not factored into calculations.

Average Hourly Wind Speeds

LST ^d	131 ft AGL		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s
0000	19.0	8.49	16.9	7.55	13.6	6.10
0100	18.8	8.40	16.8	7.52	13.6	6.07
0200	18.8	8.42	17.0	7.58	13.6	6.07
0300	18.8	8.42	17.1	7.66	13.6	6.08
0400	19.0	8.49	17.3	7.73	13.7	6.14
0500	18.8	8.42	17.3	7.73	13.6	6.07
0600	18.6	8.31	17.0	7.61	13.4	5.99
0700	18.6	8.30	17.0	7.58	13.4	5.97
0800	18.1	8.09	16.6	7.43	13.5	6.02
0900	17.7	7.93	16.5	7.39	14.1	6.30
1000	17.8	7.95	16.9	7.58	14.9	6.68
1100	17.9	8.02	17.3	7.72	15.4	6.90
1200	18.2	8.11	17.5	7.84	15.8	7.08
1300	18.4	8.25	17.7	7.92	16.1	7.18
1400	18.5	8.27	17.7	7.90	16.1	7.20
1500	18.5	8.28	17.6	7.85	16.0	7.16
1600	18.5	8.29	17.6	7.88	15.9	7.09
1700	18.0	8.03	16.9	7.55	14.8	6.61
1800	17.5	7.82	16.0	7.17	13.4	5.99
1900	17.6	7.89	16.0	7.14	12.7	5.68
2000	18.1	8.10	16.3	7.30	13.0	5.80
2100	18.6	8.33	16.7	7.45	13.3	5.95
2200	18.9	8.46	16.9	7.55	13.6	6.09
2300	19.0	8.51	17.0	7.60	13.7	6.12

**North Dakota Utility Study – Alfred Site
Falls 1994, 1995, 1996 & 1997**



^d Local standard time.



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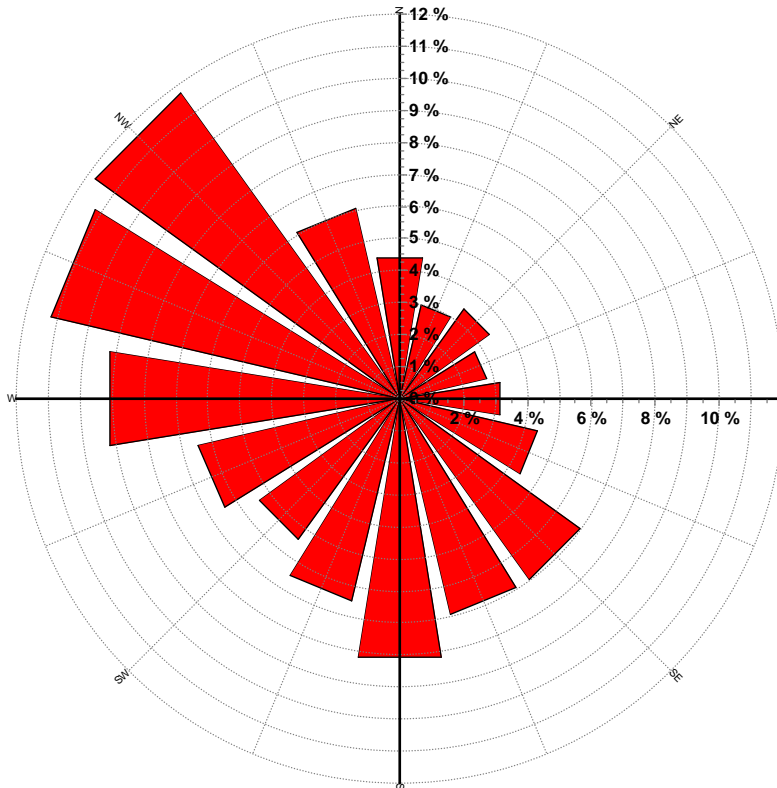
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Wind Directional Frequency

Winds from the... Frequency (%)

NNW	6.1
NW	11.8
WNW	11.2
W	9.2
WSW	6.5
SW	5.4
SSW	6.5
S	8.2
SSE	6.9
SE	7.0
ESE	4.4
E	3.2
ENE	2.8
NE	3.4
NNE	3.0
N	4.4

North Dakota Utility Study – Alfred Site
Wind Rose for 131 ft AGL
Falls 1994, 1995, 1996 & 1997

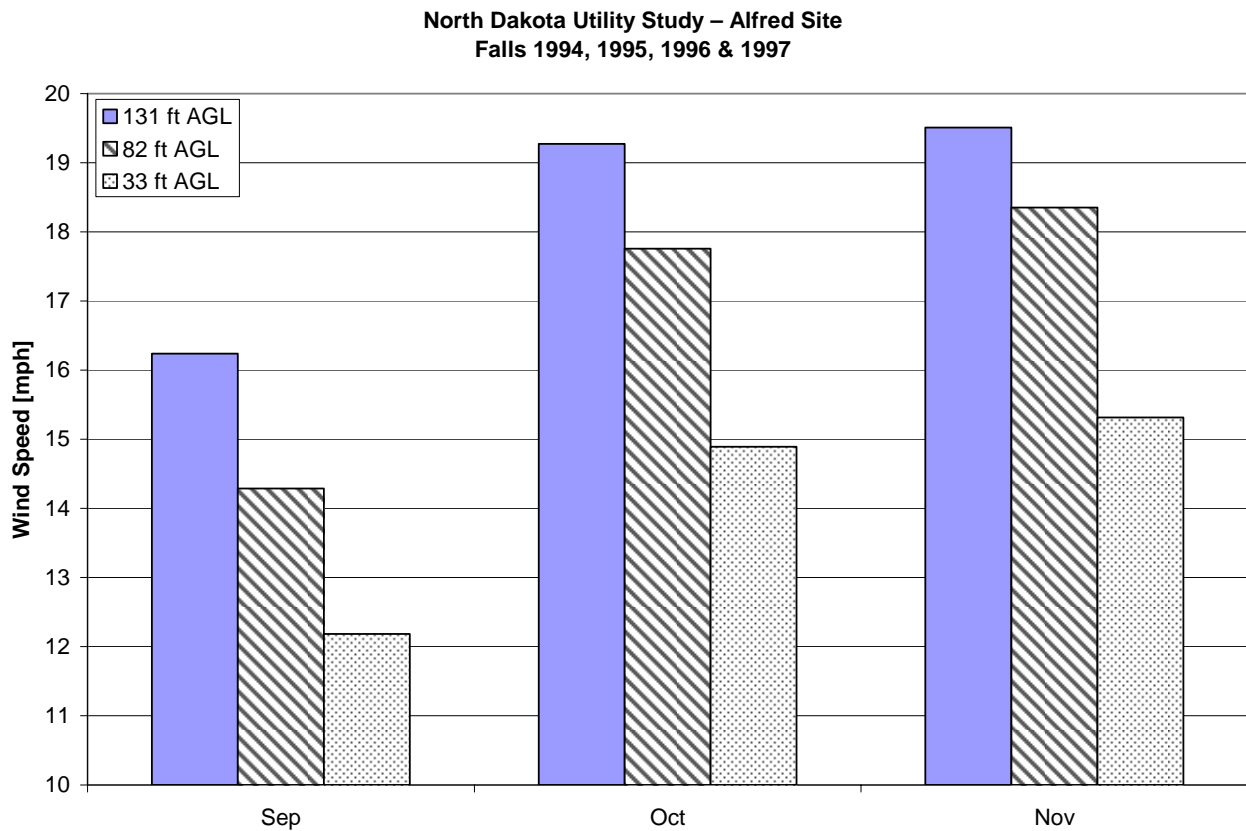


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Monthly Wind Speed Averages

Month	131 ft AGL		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s
Sep	16.2	7.26	14.3	6.39	12.2	5.45
Oct	19.3	8.62	17.8	7.94	14.9	6.66
Nov	19.5	8.72	18.3	8.20	15.3	6.85



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