

Wind Resource Summary for Olga #4 Site

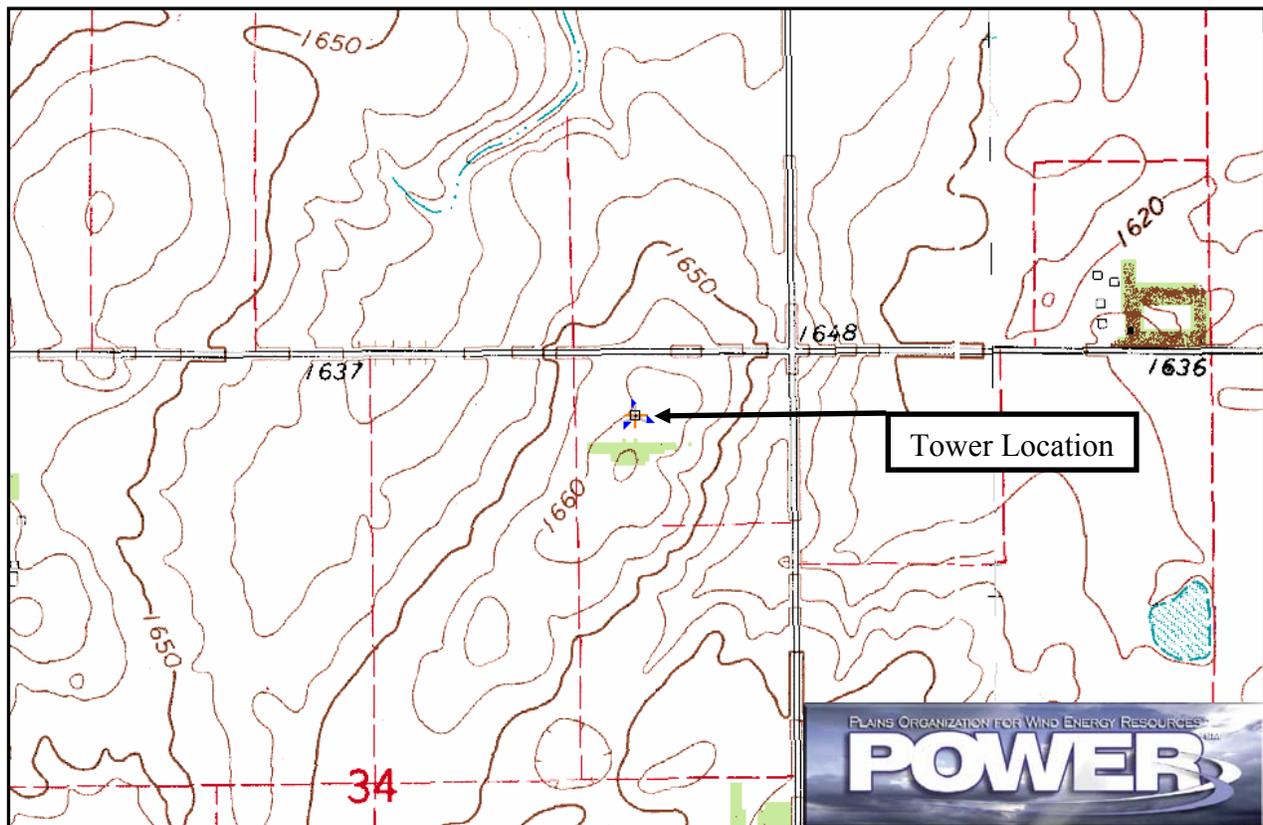
North Dakota Utility Study

Monitoring Period:^a 10/1/1994 – 10/16/1996

Site Description:

Latitude: N 48° 49' 5"	Township: 162 N
Longitude: W 98° 15' 35"	Range: 59 W
Elevation: 1670 feet	Section: 34
Tower Type: NRG Tilt-Up	Tower Height: 33 feet

The monitoring site was 6.7 miles northeast of the town of Langdon, North Dakota. The tower was instrumented at one height, 33 feet (10 m). The site was located on a small rise west of the Pembina Escarpment. The terrain around the site is predominantly cultivated fields with a number of small water reservoirs.



Summary Wind Data:	33 ft AGL^b
Mean Wind Speed	13.4 mph
Maximum, 60-min Mean Wind Speed	50.9 mph – 12/5/1995 1:00 a.m.
Estimated Wind Power Class^c	Class 4 (250 W/m ²)

^a Data recovery rate for the wind direction was 58%; data recovery rate for wind speed was 78%.

^b Above ground level.

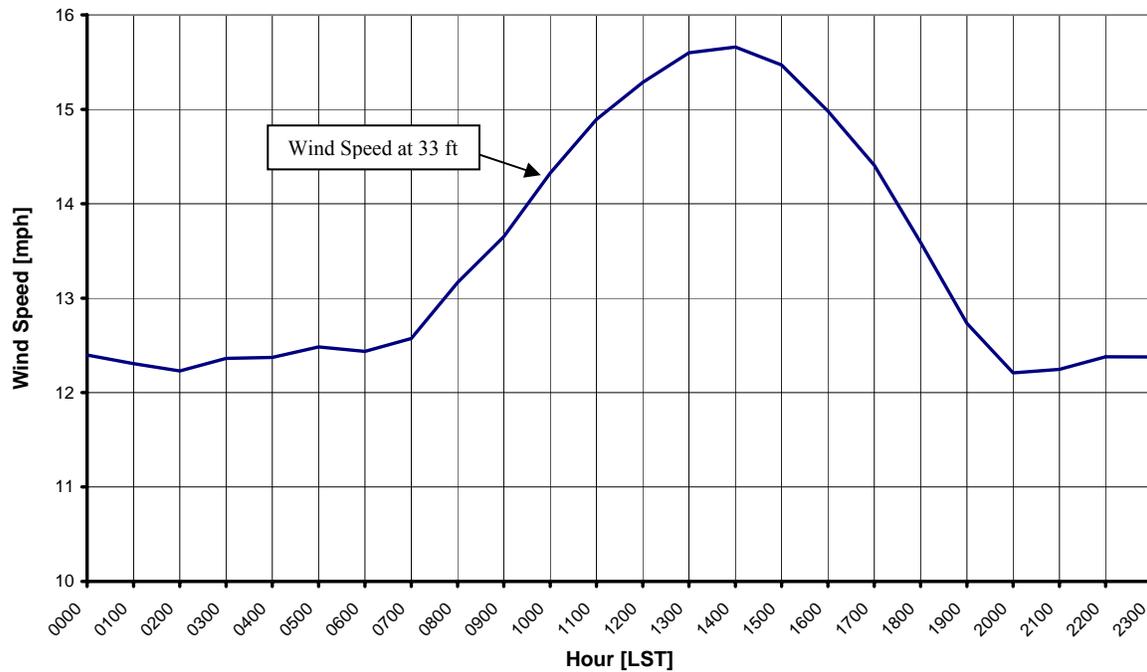
^c Air temperature was not factored into calculation.

Average Hourly Wind Speeds

33 ft AGL

LST ^d	mph	m/s
0000	12.4	5.54
0100	12.3	5.50
0200	12.2	5.47
0300	12.4	5.53
0400	12.4	5.53
0500	12.5	5.58
0600	12.4	5.56
0700	12.6	5.62
0800	13.2	5.89
0900	13.7	6.10
1000	14.3	6.40
1100	14.9	6.66
1200	15.3	6.83
1300	15.6	6.97
1400	15.7	7.00
1500	15.5	6.92
1600	15.0	6.70
1700	14.4	6.44
1800	13.6	6.08
1900	12.7	5.69
2000	12.2	5.46
2100	12.2	5.47
2200	12.4	5.53
2300	12.4	5.53

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10/1/1994 – 10/16/1996



^d Local standard time.



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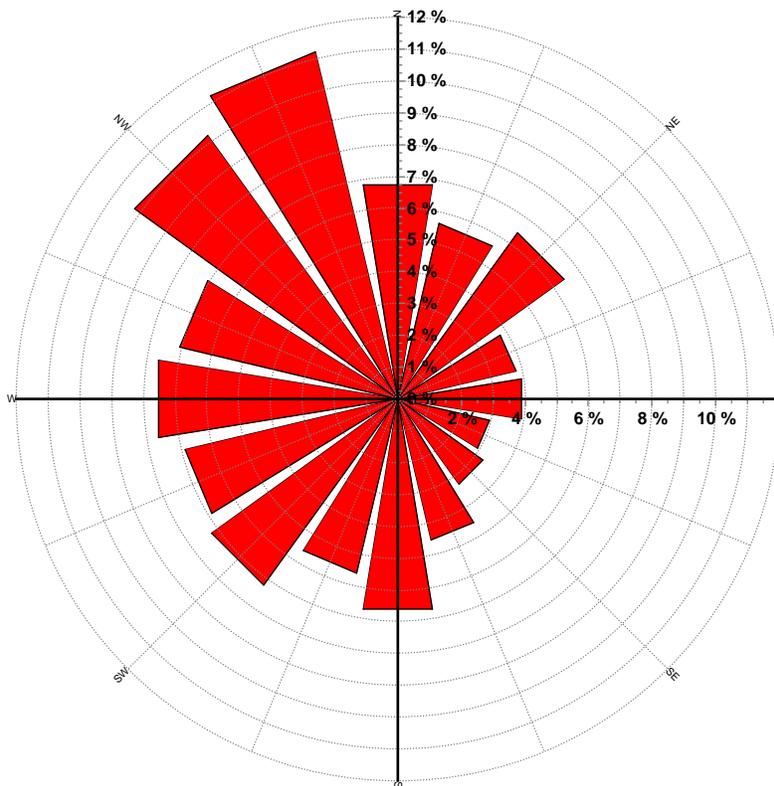
Wind Directional Frequency

Winds from the... Frequency (%)

NNW	11.2
NW	10.2
WNW	7.1
W	7.6
WSW	6.9
SW	7.2
SSW	5.6
S	6.7
SSE	4.6
SE	3.3
ESE	3.0
E	3.9
ENE	3.8
NE	6.4
NNE	5.7
N	6.8

* Direction sensor failed during last 5 months of data collection.

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Wind Rose for 33-ft AGL
10/1/1994 - 3/31/1995 & 7/5/1995 - 5/21/1996



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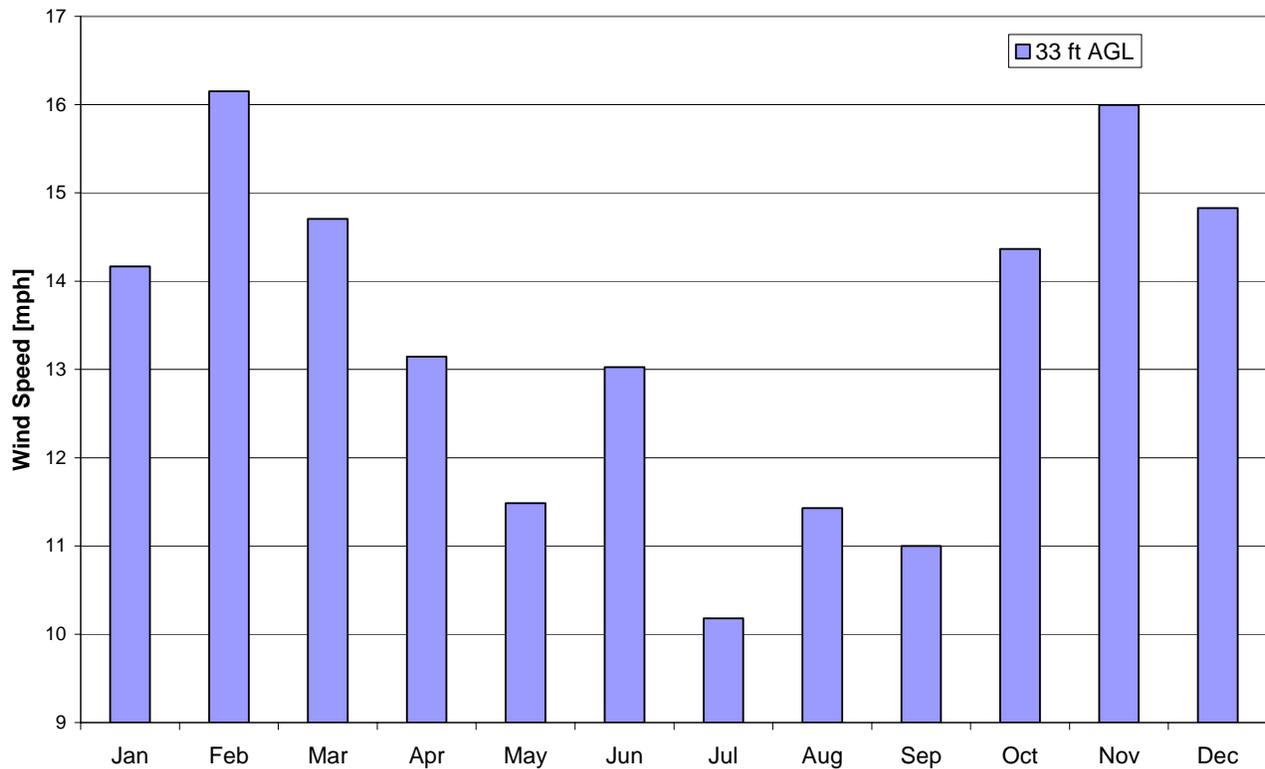
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Monthly Wind Speed Averages

33 ft AGL

Month	mph	m/s
Jan	14.2	6.33
Feb	16.2	7.22
Mar	14.7	6.57
Apr	13.1	5.88
May	11.5	5.13
Jun	13.0	5.82
Jul	10.2	4.55
Aug	11.4	5.11
Sep	11.0	4.92
Oct	14.4	6.42
Nov	16.0	7.15
Dec	14.8	6.63

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