

# Wind Resource Summary for Benedict Site

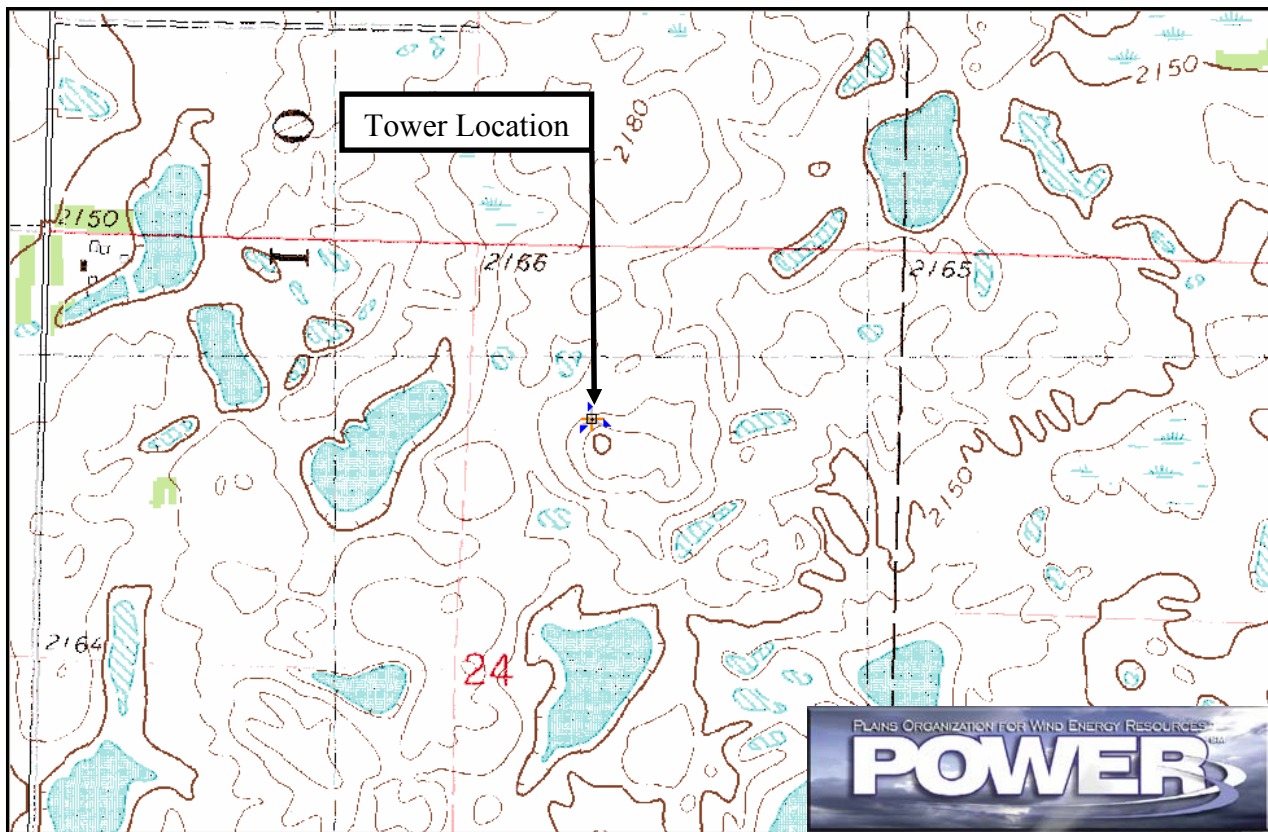
## North Dakota Utility Study

### Winters<sup>a</sup> 1994, 1995, and 1996

#### Site Description:

Latitude: N 47° 53' 20"	Township: 151 N
Longitude: W 101° 6' 25"	Range: 82 W
Elevation: 2185 feet	Section: 24
Tower Type: NRG Tilt-Up	Tower Height: 131 feet

The monitoring site was located on the Missouri Escarpment roughly 4.2 miles north-northwest of the town of Benedict, North Dakota. The tower was instrumented at three levels: 33 feet (10 m), 82 feet (25 m), and 131 feet (40 m). The land around the site was primarily cultivated fields with several small ponds and lakes in the area.



<b>Summary Wind Data:</b>	<b>33 ft AGL<sup>b</sup></b>	<b>82 ft AGL</b>	<b>131 ft AGL</b>
<b>Mean Wind Speed</b>	14.9 mph	17.5 mph	18.8 mph
<b>Maximum, 60-min Mean Wind Speed</b>	58.9 mph at 131 ft AGL – 2/10/1996 4:00 a.m.		
<b>Estimated Wind Power Class<sup>c</sup></b>	Class 6 (560 W/m <sup>2</sup> at 131 ft AGL)		

<sup>a</sup> Winter is defined as the months of December, January, and February. Winter 1994 begins with December 1994. Data recovery rates at 33, 82, and 131 feet were 52%, 77%, and 78%, respectively.

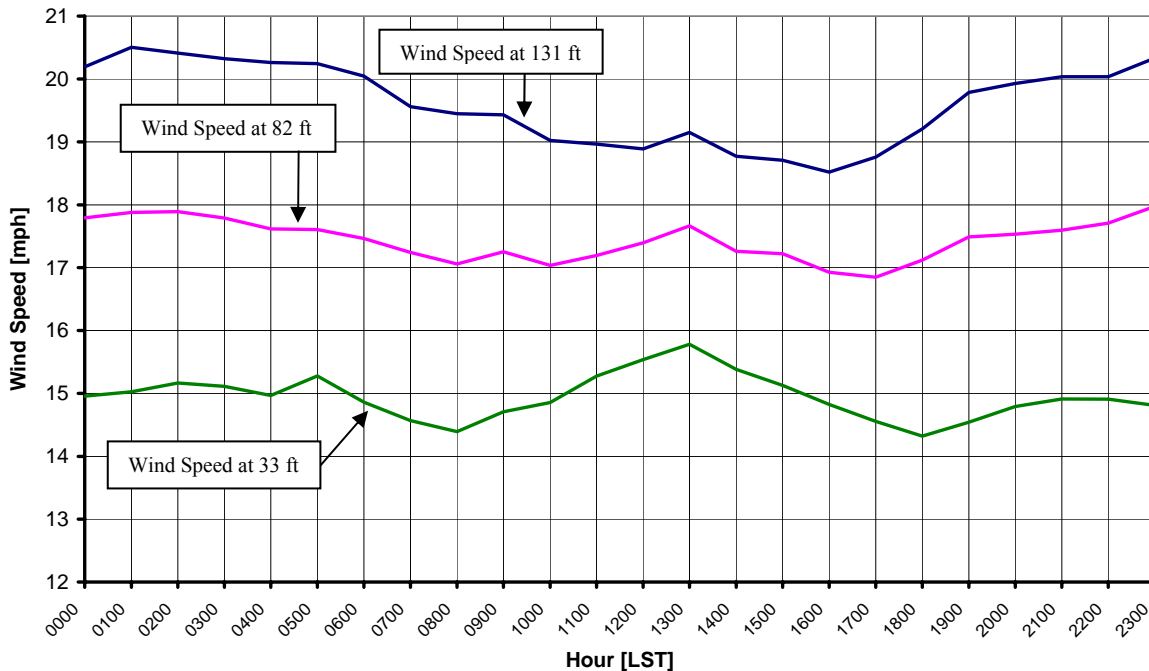
<sup>b</sup> Above ground level.

<sup>c</sup> Air temperature was not factored into calculations.

## Average Hourly Wind Speeds

LST <sup>d</sup>	131 ft AGL		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s
0000	20.2	9.03	17.8	7.95	15.0	6.69
0100	20.5	9.17	17.9	7.99	15.0	6.72
0200	20.4	9.13	17.9	8.00	15.2	6.78
0300	20.3	9.09	17.8	7.95	15.1	6.75
0400	20.3	9.06	17.6	7.88	15.0	6.69
0500	20.2	9.05	17.6	7.87	15.3	6.83
0600	20.0	8.96	17.5	7.81	14.9	6.64
0700	19.6	8.75	17.2	7.71	14.6	6.51
0800	19.4	8.69	17.1	7.63	14.4	6.43
0900	19.4	8.69	17.3	7.71	14.7	6.57
1000	19.0	8.50	17.0	7.62	14.9	6.64
1100	19.0	8.48	17.2	7.69	15.3	6.83
1200	18.9	8.44	17.4	7.78	15.5	6.95
1300	19.2	8.56	17.7	7.90	15.8	7.05
1400	18.8	8.39	17.3	7.72	15.4	6.88
1500	18.7	8.36	17.2	7.70	15.1	6.76
1600	18.5	8.28	16.9	7.57	14.8	6.63
1700	18.8	8.39	16.8	7.53	14.6	6.51
1800	19.2	8.59	17.1	7.65	14.3	6.40
1900	19.8	8.85	17.5	7.82	14.5	6.50
2000	19.9	8.91	17.5	7.84	14.8	6.61
2100	20.0	8.96	17.6	7.87	14.9	6.67
2200	20.0	8.96	17.7	7.92	14.9	6.66
2300	20.3	9.09	18.0	8.04	14.8	6.62

**North Dakota Utility Study – Benedict Site  
Winters 1994, 1995 & 1996**



<sup>d</sup> Local standard time.



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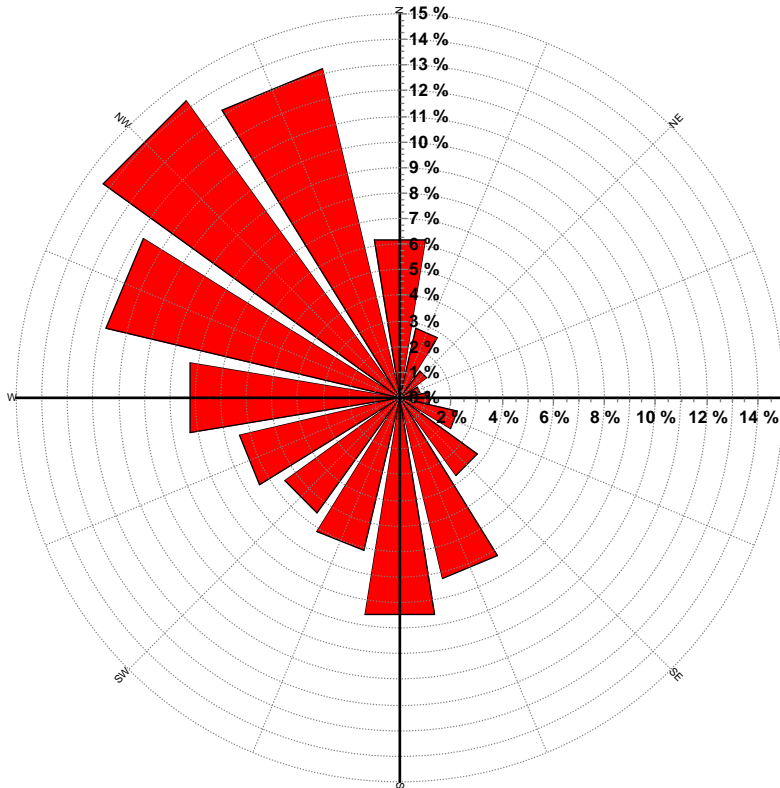
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## Wind Directional Frequency

**Winds from the... Frequency (%)**

NNW	13.2
NW	14.3
WNW	11.8
W	8.3
WSW	6.4
SW	5.6
SSW	6.1
S	8.6
SSE	7.2
SE	3.7
ESE	2.3
E	1.2
ENE	0.8
NE	1.3
NNE	2.8
N	6.2

North Dakota Utility Study – Benedict  
Wind Rose for 131 ft AGL  
Winters 1994, 1995 & 1996

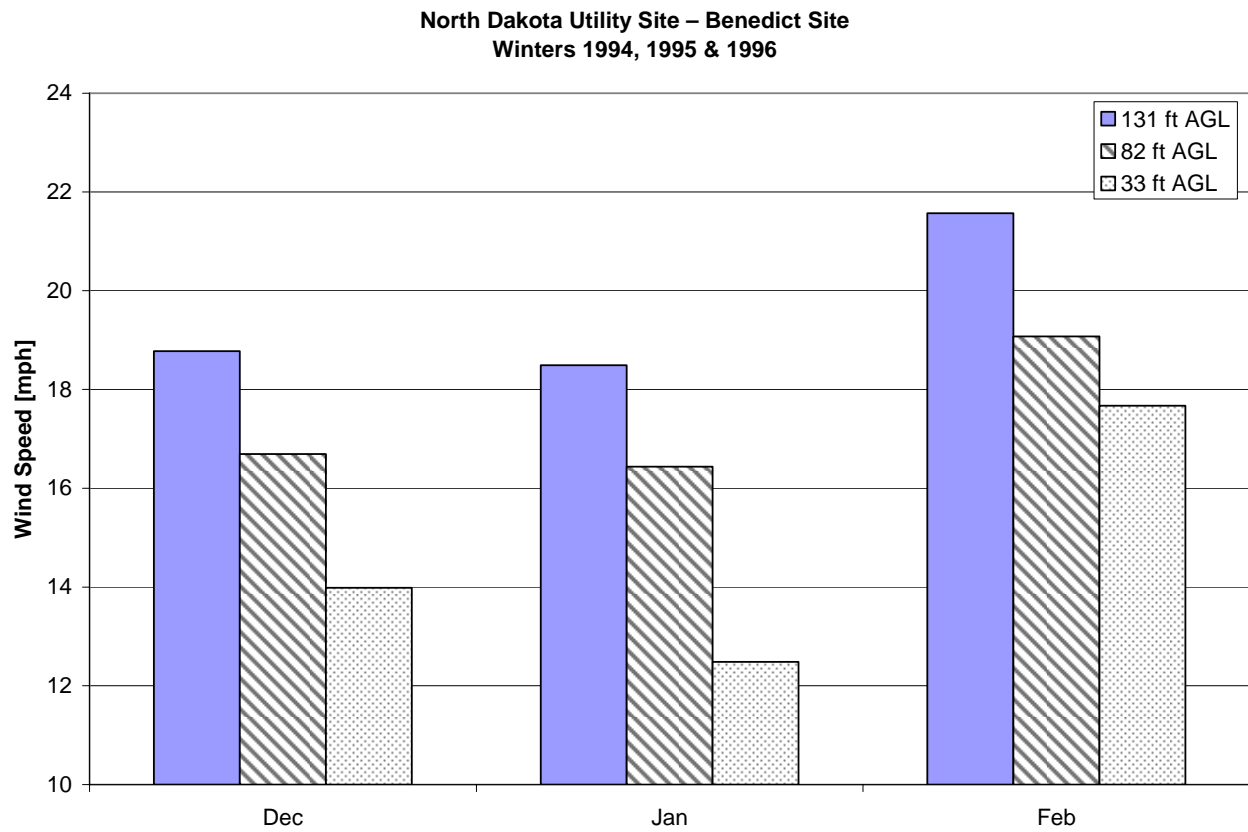


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## Monthly Wind Speed Averages

Month	131 ft AGL		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s
Dec	18.8	8.39	16.7	7.46	14.0	6.25
Jan	18.5	8.27	16.4	7.35	12.5	5.58
Feb	21.6	9.64	19.1	8.53	17.7	7.90



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