

ST. OLAF COLLEGE WIND TURBINE

Turbine went on Line September 18, 2006

Tower height is 220 feet

Tower weighs 116 tons

Nacelle weighs 57 tons

Rotor and Blades weigh 47 tons

Poured Reinforced Concrete Base is 52' in diameter and 7.5' at its thickest point and weighs over 2 million pounds

Tie points of fall protection are painted bright yellow

Blades are made of wood covered glass fabric and epoxy coated

Each blade is 130 feet long and weighs 8.3 tons

The yaw system keeps the rotor upwind in changing wind directions

The yaw system is powered by electric motors and controlled by the wind turbine controller

The yaw system can turn the blades out of the wind in emergency or maintenance situations

Slip rings are used to transfer electrical power and communication signals to the hub

Hydraulic oil is transferred to and from the hub through a rotating union

The normal way to brake the turbine is to pitch the blades to the stop position

The mechanical brake is applied: During extreme wind

Before arresting the rotor with the rotor lock

During start-up to ensure the rotor does not run

Backwards

When parking for other reasons as needed

Minimum wind speed to produce electricity is 7.8 mph

Wind speed to produce full output is 29 mph

Turbine shuts down if: Wind speed is 44.7 mph for 10 minutes

Wind speed is 53.7 mph for 1 minute

Wind speed is 71.6 mph for 1 second

Rotor speed is 14.3 rpm

Generator speed is 1200 rpm

Maximum output is 1,650 kw

Output voltage is 600 vac

ST. OLAF COLLEGE WIND TURBINE

MONTH	TIME AVAILABLE (hrs)	PERCENT TIME AVAILABLE	TIME ON-LINE (hrs)	PERCENT TIME ON-LINE	CAMPUS ENERGY USED (kwh)	WIND ENERGY GENERATED (kwh)	PERCENT WIND OF CAMPUS NEED	PERCENT OF MAXIMUM CAPACITY	SAVINGS PER KWH OF WIND POWER	TOTAL SAVINGS
October-06	698.7	93.9	579.5	77.9	1,600,397	297,123	18.6	24.2		
November-06	685.0	95.1	559.8	77.8	1,492,635	237,764	15.9	20.0		
December-06	742.3	99.8	669.2	89.9	1,343,888	369,168	27.5	30.1		
January-07	719.3	96.7	626.9	84.3	1,484,441	395,839	26.7	32.2		
February-07	667.2	99.3	543.7	80.9	1,423,151	280,269	19.7	25.3		
March-07	742.4	99.8	643.9	86.5	1,449,682	379,377	26.2	30.9		
April-07	714.7	99.3	617.3	85.7	1,481,379	369,007	24.9	31.1		
May-07	696.0	93.5	606.2	81.5	1,574,362	385,439	24.5	31.4		
TOTAL 06-07	5,665.6	97.1	4,846.5	83.1	11,849,935	2,713,986	22.9	28.2		
June-07	685.6	95.2	541.6	75.2	1,298,791	241,360	18.6	20.3		
July-07	686.9	92.3	508.5	68.3	1,449,248	168,888	11.7	13.8		
August-07	731.7	98.3	486.8	65.4	1,296,288	129,107	10.0	10.5		
September-07	698.7	97.0	611.1	84.9	1,705,983	357,111	20.9	30.1		
October-07	730.0	98.1	585.0	78.6	1,667,854	353,731	21.2	28.8		
November-07	713.4	99.1	640.8	89.0	1,516,464	392,058	25.9	33.0	\$0.037405	\$14,664.93
December-07	739.9	99.4	500.2	67.2	1,415,123	196,308	13.9	16.0	\$0.039158	\$7,687.03
January-08	712.6	95.8	580.6	78.0	1,604,716	295,577	18.4	24.1	\$0.035692	\$10,549.73
February-08	637.0	91.5	469.2	67.4	1,567,192	242,667	15.5	21.1	\$0.028340	\$6,877.18
March-08	736.0	98.9	579.0	77.8	1,472,044	249,110	16.9	20.3	\$0.026973	\$6,719.24
April-08	647.9	90.0	557.9	77.5	1,594,251	350,445	22.0	29.5	\$0.029646	\$10,389.29
May-08	577.2	77.6	470.6	63.3	1,503,585	212,189	14.1	17.3	\$0.020275	\$4,302.13
TOTAL 07-08	8,296.9	94.5	6,531.3	74.4	18,091,539	3,188,551	17.6	22.0		\$61,189.54
June-08	698.2	97.0	538.7	74.8	1,310,628	212,558	16.2	17.9	\$0.008869	\$1,885.18
July-08	713.3	95.9	502.7	67.6	1,464,906	175,611	12.0	14.3	\$0.048171	\$8,459.36
August-08	721.3	96.9	494.5	66.5	1,494,228	144,679	9.7	11.8	\$0.041505	\$6,004.90
September-08	702.5	97.6	569.6	79.1	1,865,639	253,382	13.6	21.3	\$0.037880	\$9,598.11
October-08	711.1	95.6	612.1	82.3	1,709,761	288,027	16.8	23.5	\$0.041210	\$11,869.59
November-08	710.6	98.7	574.0	79.7	1,521,852	329,235	21.6	27.7	\$0.047732	\$15,715.05
December-08	712.5	95.8	624.9	84.0	1,437,409	389,697	27.1	31.7	\$0.047651	\$18,569.45
January-09	722.7	97.1	587.6	79.0	1,525,284	288,426	18.9	23.5	\$0.042358	\$12,217.15
February-09	665.1	95.6	578.4	83.1	1,433,384	338,494	23.6	29.5	\$0.043147	\$14,605.00
March-09	722.1	97.1	615.5	82.7	1,524,910	349,670	22.9	28.5	\$0.040217	\$14,062.68
April-09	696.5	96.7	619.9	86.1	1,545,193	320,794	20.8	27.0	\$0.046011	\$14,760.05
May-09	676.9	91.0	589.3	79.2	1,511,349	310,287	20.5	25.3	\$0.036334	\$11,273.97
TOTAL 08-09	8,452.8	96.2	6,907.2	78.6	18,344,543	3,400,860	18.5	23.5		\$139,020.48
June-09	703.9	97.8	457.7	63.6	1,385,897	160,533	11.6	13.5	\$0.030337	\$4,870.09
July-09	719.8	96.7	500.1	67.2	1,450,253	169,023	11.7	13.8	\$0.029893	\$5,052.60
August-09	718.6	96.6	557.7	75.0	1,386,031	192,020	13.9	15.6		
September-09	705.4	98.0	448.3	62.3	1,726,762	126,074	7.3	10.6		
TOTAL 09-10	2,847.7	97.3	1,963.8	67.1	5,948,943	647,650	10.9	13.4		\$9,922.69
GRAND TOTAL	25,263.0	96.0	20,248.8	76.9	54,234,960	9,951,047	18.3	22.9		\$210,132.72

DATE & TIME	MINIMUM TURBINE OUTPUT (kw)	AVERAGE TURBINE OUTPUT (kw)	MAXIMUM TURBINE OUTPUT (kw)	TOTAL PRODUCTION (kwh)	TIME ON LINE (hrs)	TIME TURBINE AVAILABLE (hrs)	TIME TURBINE IN ALARM (hrs)
10/3/2009 13:00	71.8	284.3	491.0	292	1	1	0
10/3/2009 12:00	131.0	388.3	735.8	396	1	1	0
10/3/2009 11:00	38.5	220.7	525.7	228	1	1	0
10/3/2009 10:00	112.1	310.0	601.6	317	1	1	0
10/3/2009 9:00	173.5	526.4	929.1	534	1	1	0
10/3/2009 8:00	167.4	458.8	789.7	466	1	1	0
	38.5	364.8	929.1	2,233	6	6	0
Regents Hall Used During the Same Time Period				1,587			