Eastern Shoshone Tribe and Northern Arapahoe on the Wind River Indian Reservation

Renewable Energy Development on Tribal Lands
DE-PS36-04GO94003

Objectives and Implementation: The Tribes, through its consultant and advisor, Distributed Generation Systems (Disgen) -Native American Program and Resources Division, of Lakewood CO, assessed and qualified, from a resource and economic perspective, a wind energy generation facility on tribal lands.

The goal of this feasibility project is to provide wind monitoring and to engage in pre-project planning activities designed to provide a preliminary evaluation of the technical, economic, social and environmental feasibility of developing a sustainable, integrated wind energy plan for the Eastern Shoshone and the Northern Arapahoe Tribes, who resides on the Wind River Indian Reservation.

The specific deliverables of the feasibility study are:

1) Assessments of the wind resources on the Wind River Indian Reservation
2) Assessments of the potential environmental impacts of renewable development
3) Assessments of the transmission capacity and capability of a renewable energy project
4) Established an economic models for tribal considerations
5) Define economic, cultural and societal impacts on the Tribe

Wind Resource Assessment:

The resource assessment for wind energy included a meteorological study utilizing two fifty meter (50 m) meteorological towers for over twelve months in two locations, Sheldon Dome and Bighorn Flat. These areas are located on Tribal Trust Lands. The report for the Sheldon Dome project area is attached in **Appendix 1 Wind Resource Assessment Report**. The data collections for the Big Horn Flats are also attached. There were data collection problem for the Big Horn Flats met tower. The logger failed due to some environmental problems so the data collection was only for 8 months. The average annual wind speed was determined to be 15.8 mph at 50 meters for the project areas. The capacity factors were calculated to be 29% to 32% for various turbines.

Environmental Impacts:

Disgen utilized Western Ecosystems Technologies, Inc. of Larimer Wyoming to conduct a Preliminary Avian Assessment on the proposed site. WEST, Inc. are leading experts in the area of avian interaction with wind turbines. The report is attached in **Appendix 2**. No potential mitigating issues were identified that would stifle a wind energy project.

Transmission Capacity:

Disgen utilized the Excel Engineering of Minneapolis, MN to determine the transmission capacity for the three difference transmission system that crosses Wind River Indian Reservation, Tri-State G&T, Pacific Corp and Western Area Power Administration. The report is in **Appendix 3**.

Economic Models:

Disgen has provided an economic model for tribal consideration. The financial model shows the capital budget for construction of a 23 MW wind energy center at the Sheldon Dome site, operation and maintenance annual costs, and taxation. The financial model and possible financing option is include in **Appendix 4**.

Economic, Cultural and Societal Impacts:

The Tribes Tribal Historic Preservation Offices have conducted a cultural assessment review of the project and have chosen not to report those results at this time.

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Appendix 1

The data are summarized in the form of mean hourly values and are presented in Tables 2 through 6. These tables include the monthly average values for wind speed, as well as the data recovery for each month and the entire period of record.

Wind Shear

Wind shear is the change or increase in wind speed above ground level. The simple wind power law is expressed as:

$$U_2 = U1\ (Z_2/Z_1)^{\text{alpha}}$$

Where U_2 and U_1 are the wind speeds at the upper and lower levels, Z_2 and Z_1 are the upper and lower elevations, and alpha is the wind speed power law exponent. The typical value for the wind speed power law exponent is 0.14 (1/7 power law). Depending on terrain and surface roughness, the value may vary between zero and greater than 0.35.

The data collected at the 30-meter level and the 50-meter level are used to determine the wind shear at the tower. Pairs of data are matched for these two parameters when the wind speed at the lower level is greater than or equal to 10 mph (3.5 mps) and the wind direction is between 200 degrees and 350 degrees. This condition eliminates overstating the wind shear when the wind speed at the lowest level of the tower is calm and attempts to avoid any potential tower shadow affects. The calculated wind speed ratio between the two levels is 1.05 which results in a determined power law coefficient or alpha value of 0.10.

Wind Rose

A wind rose for the site is presented in Figure 6. This wind rose is based on the wind speed and wind direction data collected at the 50-meter level of the tower. The wind rose indicates a predominant west-northwest wind direction.

Turbulence Intensity

The turbulence intensity (TI) for the site, as calculated from the wind speed data collected at 50-meters above ground level, is presented in Table 7. The TI data indicate the turbulence at this site approaches 10.8% at the critical wind speed bin of 15 mps.

Peak Wind Speed – Hub Height

The fastest mile wind speed for the site (50-year return period) at 10-meters agl is estimated from Thom as 90 miles per hour (mph). This fastest mile value is used to estimate the peak gust of 109.8 mph at 10-meters agl. Assuming a power law exponent for gusts of 0.11, the predicted peak gust (50-yr return period) at the 80-meter hub height is 138 mph or 61.6 mps.

Figure 1 - The Wind River Indian Reservation is located in Fremont County in north-central Wyoming

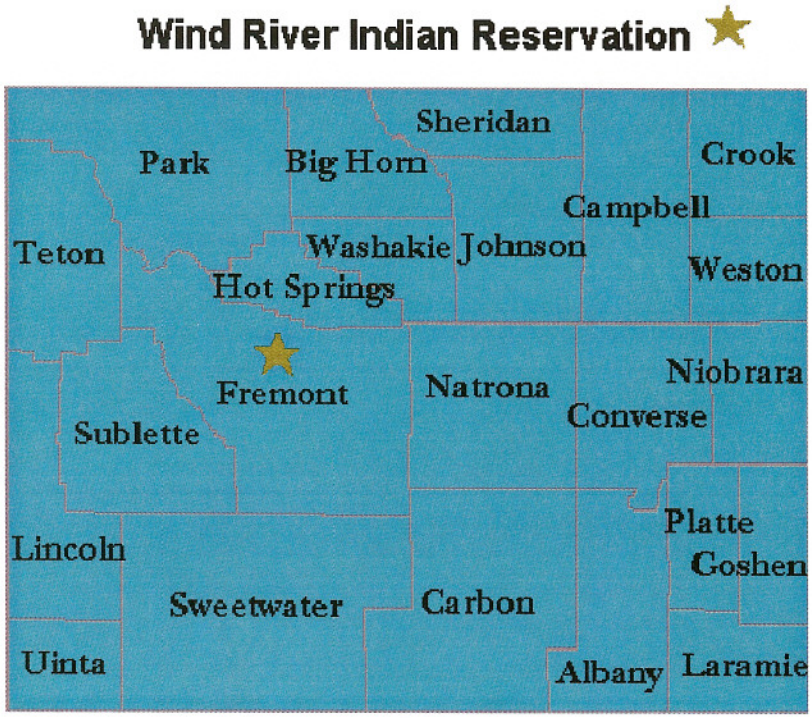
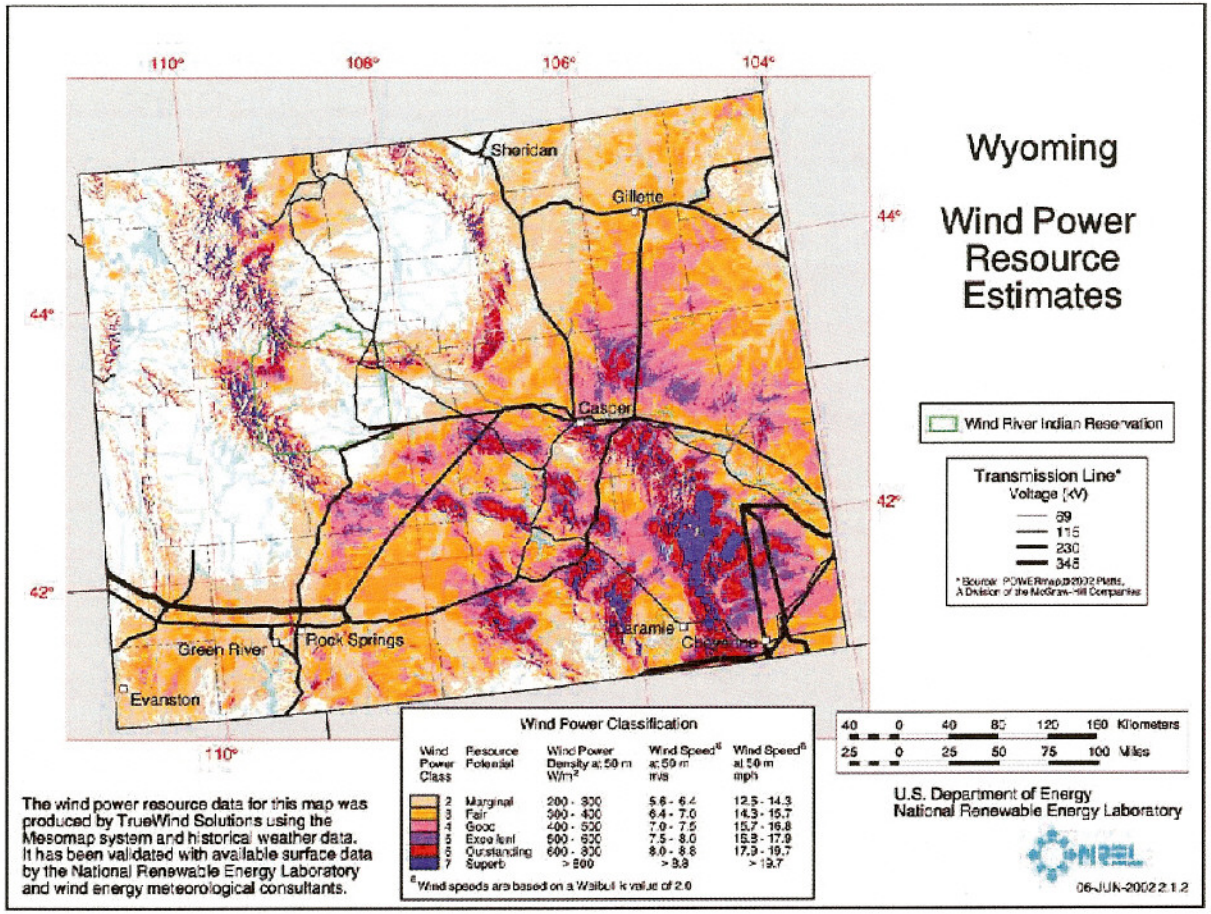


Figure 2 – Wyoming Wind Map



Summary Report
Wind Resource and Theoretical Energy Output Projections at the Wind River Indian Reservation

Summary

A 50-meter NRG Systems Talltower is installed in February 2007 on the Wind River Indian Reservation in Wyoming and over a full year of meteorological measurements of wind speed at three levels, wind direction at two levels and temperature are collected. The 50.0-meter average wind speed for the entire period from February 2007 until July 2008 is 15.9 miles per hour (mph) or 7.1 meters per second (mps).

Location

A wind data collection program is initiated on the Wind River Indian Reservation in February of 2007. The Wind River Indian Reservation is located in Fremont County as shown in Figure 1. The wind map for the State of Wyoming is presented in Figure 2. The wind power classification for the Wind River Indian Reservation ranges from less than Class 3 (Fair) in the southeastern portion to Class 6 (Excellent) and Class 7 (Outstanding) in the higher terrain in the far western portion.

Meteorological Data Collection Program

A 50-meter NRG Systems Talltower is installed in February 2007. The location of the meteorological tower is shown in Figure 3. Two Maximum #40 wind speed sensors are installed at 49.5-meters above ground level (agl) designated as South and West; two Maximum #40 wind speed sensors are installed at 40-meters agl, also designated as South and West; one Maximum #40 wind speed sensor is installed at 30-m agl; one #200P wind direction sensor is installed at 48.5-meters and one #200P wind direction sensor is installed at 37-m agl; and a #110S temperature sensor is installed at 7 feet (2 meters) agl. The sensors are connected to a NRG Symphonie Data Logger which collects the data at 1-second intervals and creates 10-minute averages of each parameter. The tower installation form is presented in Table 1.

Data Analysis

Meteorological data for the Wind River Indian Reservation Site are obtained routinely via pulling the MMC card from the NRG Symphonie logger, reading the card, and e-mailing the data files. Once received, the data are error-checked and loaded into the data archive. The period of record is February 17, 2007 to July 17, 2008.

Wind Speed Characteristics

The mean wind speed at the 30-meter level for the entire period of record is 15.2 mph; the mean wind speed for the 40-meter level for the entire period of record is 15.5 mph and 15.4 mph, respectively, for the south and west booms; the mean wind speed for the 50m-level for the entire period of record is 15.8 mph and 15.9 mph, respectively for the south and west booms. The monthly average wind speeds at the 50-meter level for February 2007 to July 2008 are presented in Figure 4 and show a winter maximum and a summer minimum. The diurnal wind speed pattern is presented in Figure 5 which shows a slight increase in daytime wind speeds and a minimum in the early morning and early evening.

Figure 3 – Location of the Meteorological Tower at the Wind River Site

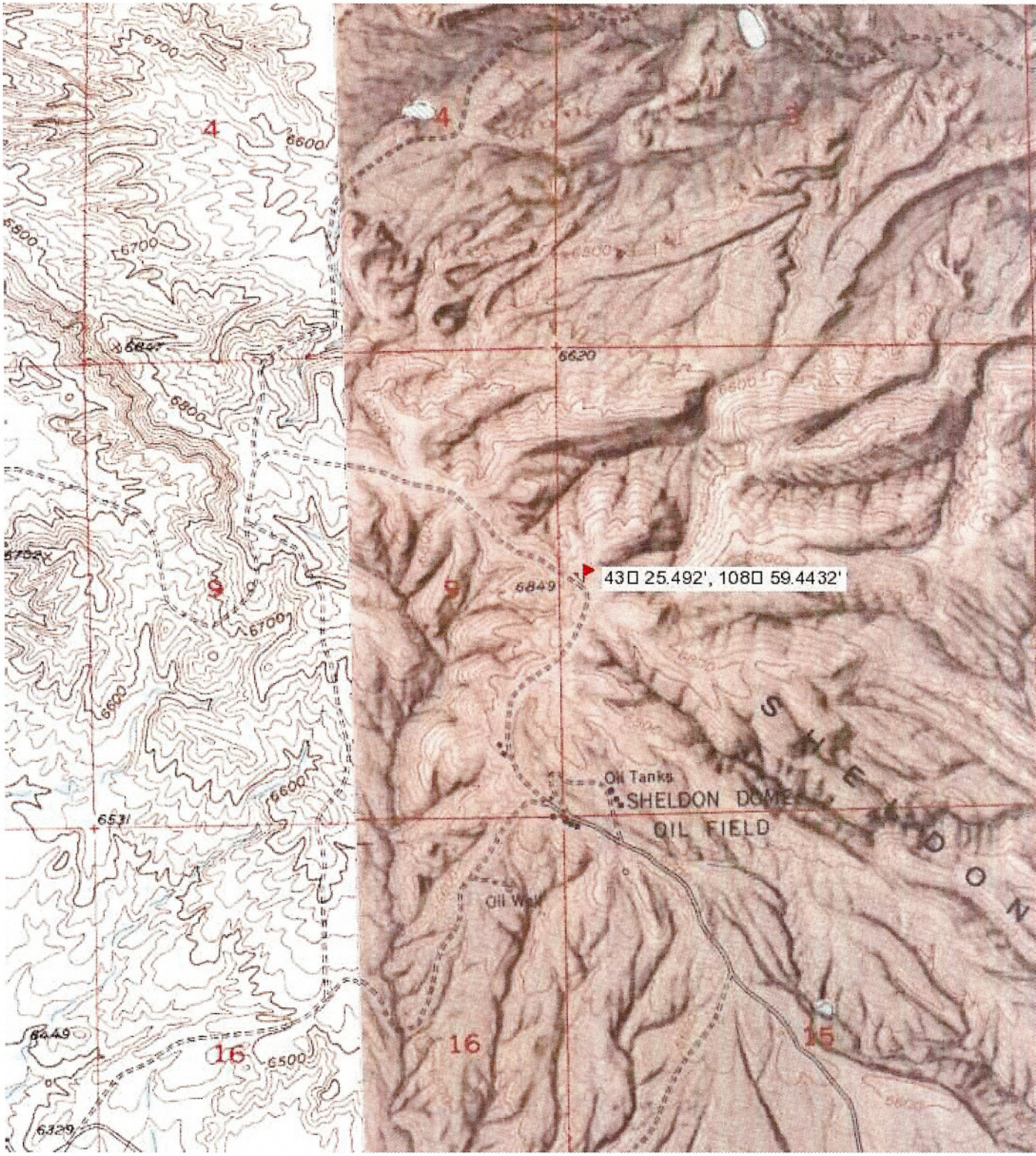


Table 1

Wind Resource Assessment
Site Information Form

Site Name	**Sheldon Dome**	**Installation Date**	**2/17/07**
Site Number	**1376**	**Removal Date**	
State	**Wyoming**	**Tower Height**	**50-Meters**
Latitude	**N 43 Deg 25.492'**	**Quad Map**	
Longitude	**W 108 Deg 59.443'**	**Sec/Town/Range**	
Elevation	**6,880'**	**Datum**	**WGS84**
UTM			

Data Logger & Sensors	Height (agl)	Serial #	Slope	Offset	Terminal Location	Comment
NRG Symphonie		1376				
Max 40	49.5m		1.711	0.8	1	South
Max 40	49.5m		1.711	0.8	2	west
Max 40	40m		1.711	0.8	3	South
Max 40	40m		1.711	0.8	4	West
Max 40	30m		1.711	0.8	5	South
200P	48.5m				7	South
200P	37m				8	South
Temp	7m					

Phone Make/Model		**ISP**	
Phone Number		**E-Mail Address**	
ESN#		**E-Mail Address**	
Serial Number			
Cell Company			
Activation Date			

Land Owner		**Site Rep**	
Address		**Address**	
Phone #		**Phone #**	
E-Mail		**E-Mail**	

Five anemometers – two at 49.5m; two at 40m; one at 30m; booms point as indicated in comments Above. Wind directions point south ; oriented to true north.

Figure 4- Monthly Average Wind Speed at the 50M Level for February 2007 to July 2008

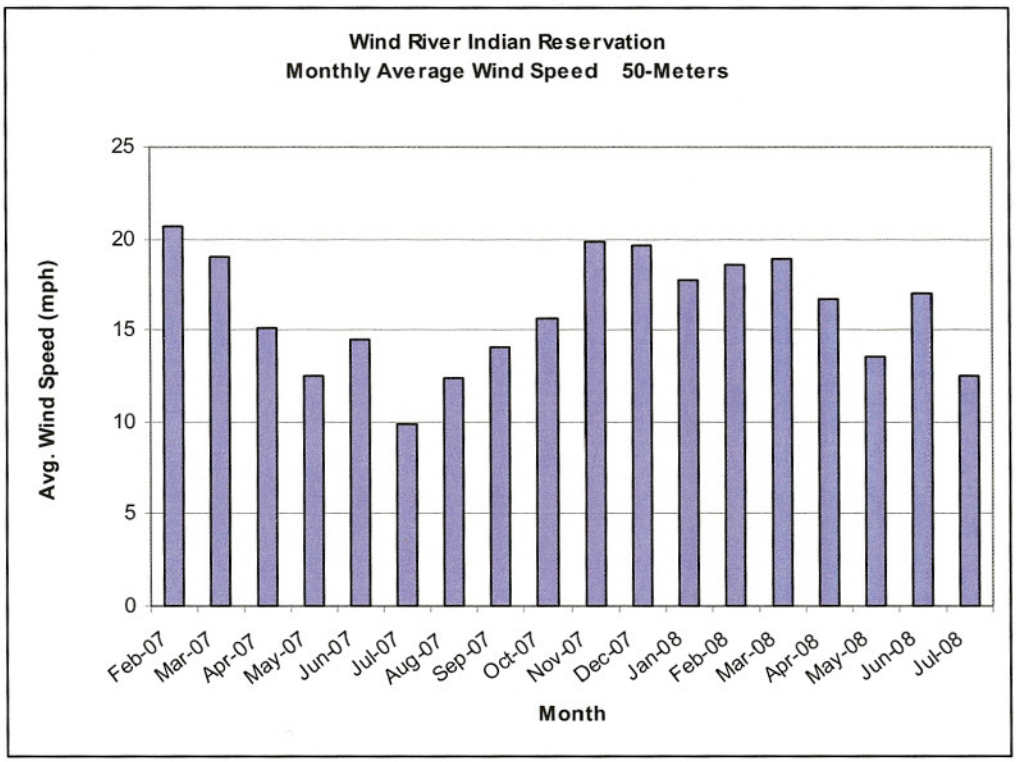


Figure 5 - Diurnal Wind Speed Pattern

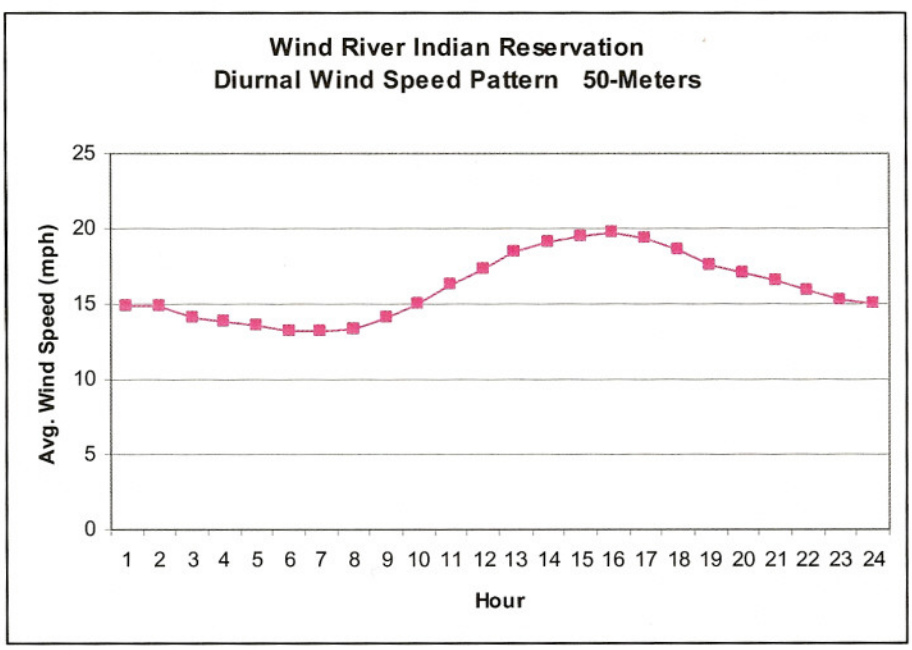


Table 2– Mean Hourly Wind Speeds (mph) at 30M agl

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 30M WIND SPEED (S) (MPH)

02/01/07 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	16.3	17.5	15.9	13.7	10.8	12.1	8.0	9.6	11.8	14.3	20.8	18.7	13.7
02	16.2	17.5	16.0	13.9	10.2	11.6	8.4	9.9	11.5	13.7	20.3	20.5	13.7
03	16.7	17.3	16.0	12.3	9.5	10.4	7.5	8.9	11.5	14.5	19.0	19.7	13.1
04	17.2	16.8	16.0	13.3	8.7	10.2	6.7	8.3	10.9	14.8	19.2	19.7	13.0
05	16.1	15.8	14.9	12.8	8.9	9.9	6.9	8.6	10.6	15.2	18.2	20.3	12.7
06	15.0	15.4	15.0	11.8	9.4	9.4	6.5	8.0	10.0	15.0	18.0	19.5	12.3
07	15.5	15.1	16.4	11.5	9.8	12.0	6.5	7.9	10.5	13.9	16.1	17.3	12.5
08	16.1	15.1	16.4	12.6	10.5	13.0	7.1	8.9	10.9	12.8	15.9	15.1	12.8
09	16.2	16.0	18.0	13.8	11.7	13.7	8.3	9.7	11.7	13.0	15.0	14.6	13.6
10	17.5	16.4	19.1	14.3	12.8	14.8	9.3	11.5	12.6	13.8	16.7	15.7	14.6
11	19.0	17.5	20.0	15.4	13.1	16.5	10.7	14.1	14.0	14.1	18.0	17.4	15.8
12	20.1	18.7	20.9	17.3	14.8	17.3	11.6	14.3	14.6	15.0	18.8	17.8	16.8
13	19.4	20.5	21.7	18.8	16.1	19.0	13.6	14.9	15.8	16.3	19.4	18.4	18.0
14	19.1	21.8	21.9	19.8	15.6	19.4	13.9	16.8	16.4	16.9	21.2	20.0	18.6
15	18.3	22.7	22.1	19.9	16.2	20.7	14.6	16.2	17.4	17.5	21.0	19.5	19.0
16	17.3	22.4	22.9	20.3	17.5	20.8	14.7	16.6	18.6	16.8	19.5	19.1	19.2
17	17.1	20.4	21.9	20.1	17.1	20.8	13.9	16.9	17.9	15.7	19.1	18.4	18.6
18	14.9	20.2	19.5	18.6	16.6	20.0	14.1	16.0	15.1	15.0	19.1	18.9	17.6
19	15.2	19.6	17.6	16.9	14.4	18.2	14.4	14.0	14.4	14.4	18.7	18.7	16.5
20	15.6	19.8	17.7	15.4	12.6	16.6	13.5	13.2	14.3	14.8	19.7	17.7	15.8
21	16.1	18.7	16.9	14.7	12.8	14.4	12.1	12.8	14.2	14.4	21.1	19.5	15.4
22	15.6	17.9	17.0	14.8	11.1	13.8	10.2	11.3	13.5	15.3	20.0	21.1	14.8
23	15.9	18.0	16.0	13.7	10.4	14.1	9.3	10.6	12.9	15.6	19.6	20.4	14.3
24	16.3	17.6	15.2	13.2	10.4	13.2	8.6	9.9	12.7	15.1	19.5	19.6	13.9
Mean	16.8	18.3	18.1	15.4	12.5	15.1	10.4	12.0	13.5	14.9	18.9	18.6	15.2

Good Hours												
720	972	1488	1387	1488	1440	1141	744	720	744	720	744	

Missing Hours												
24	396	0	53	0	0	347	0	0	0	0	0	

12,308 Hours of Good Data 820 Hours Missing 93.8% Data Recovery

Table 3 – Mean Hourly Wind Speed (mph) at 40M agl

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 40M WIND SPEED (S) (MPH)

02/01/07 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	16.8	18.0	16.3	14.2	11.0	12.6	8.1	9.8	12.3	14.8	21.3	19.1	14.1
02	16.7	18.1	16.5	14.3	10.4	12.1	8.6	10.0	11.9	14.2	21.0	20.9	14.1
03	17.2	17.9	16.4	12.6	9.7	10.7	7.5	8.9	11.9	15.0	19.6	20.1	13.4
04	17.6	17.2	16.4	13.7	8.8	10.5	6.6	8.4	11.3	15.4	19.8	20.1	13.3
05	16.6	16.2	15.4	13.1	9.1	10.0	6.9	8.8	11.0	15.8	18.8	20.8	13.0
06	15.3	15.8	15.4	12.0	9.5	9.5	6.4	8.0	10.2	15.6	18.6	20.0	12.5
07	15.8	15.4	16.6	11.5	9.8	12.0	6.3	7.8	10.8	14.4	16.7	17.4	12.6
08	16.5	15.5	16.5	12.5	10.3	13.0	6.8	8.7	11.0	13.1	16.3	15.2	12.8
09	16.5	16.2	18.1	13.8	11.6	13.7	8.1	9.6	11.7	13.2	15.2	14.8	13.6
10	17.7	16.4	19.1	14.3	12.8	14.9	9.2	11.4	12.7	14.2	16.8	15.9	14.6
11	19.0	17.5	20.0	15.5	13.1	16.6	10.7	14.2	14.1	14.2	18.1	17.5	15.8
12	20.1	18.8	21.0	17.4	14.8	17.5	11.6	14.3	14.7	15.2	19.0	17.9	16.9
13	19.4	20.9	21.8	18.8	16.2	19.2	13.7	14.9	15.9	16.5	19.7	18.5	18.1
14	19.1	21.9	22.0	19.8	15.7	19.5	14.0	16.9	16.5	17.1	21.5	20.1	18.7
15	18.4	23.0	22.3	19.9	16.3	21.0	14.7	16.3	17.5	17.7	21.3	19.8	19.2
16	17.6	22.8	23.1	20.5	17.6	21.0	14.9	16.7	18.8	17.1	20.0	19.5	19.4
17	17.4	20.8	22.3	20.3	17.2	21.1	14.1	17.1	18.2	16.2	19.7	18.7	18.9
18	15.3	20.7	20.0	18.9	16.9	20.3	14.4	16.4	15.5	15.5	19.7	19.3	18.0
19	15.6	20.2	18.1	17.4	14.9	18.8	14.8	14.5	15.0	14.9	19.2	19.2	17.0
20	15.9	20.5	18.2	15.9	13.0	17.4	14.0	13.7	15.0	15.3	20.3	18.1	16.4
21	16.5	19.3	17.5	15.1	13.3	15.1	12.5	13.2	14.7	14.9	21.9	20.0	15.9
22	15.9	18.4	17.5	15.2	11.4	14.4	10.5	11.7	14.0	15.8	20.8	21.7	15.3
23	16.3	18.5	16.4	14.1	10.6	14.7	9.5	10.9	13.4	16.0	20.3	20.9	14.7
24	16.9	18.1	15.6	13.6	10.7	13.7	8.8	10.2	13.1	15.5	20.0	20.1	14.2
Mean	17.1	18.7	18.4	15.6	12.7	15.4	10.5	12.2	13.8	15.3	19.4	19.0	15.5
Good Hours	720	972	1488	1387	1488	1440	1141	744	720	744	720	744	
Missing Hours	24	396	0	53	0	0	347	0	0	0	0	0	

12,308 Hours of Good Data 820 Hours Missing 93.8% Data Recovery

Table 4 – Mean Hourly Wind Speed (mph) at 40M agl

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 40M WIND SPEED (W) (MPH)

02/01/07 - 07/31/08

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02	16.5	18.0	16.4	14.1	10.5	12.1	8.5	9.8	11.8	14.3	20.9	20.8	14.0
03	17.0	17.8	16.4	12.5	9.7	10.7	7.4	8.8	11.7	15.0	19.6	19.9	13.4
04	17.3	17.2	16.3	13.5	8.8	10.5	6.4	8.2	11.1	15.5	19.7	20.1	13.2
05	16.4	16.2	15.4	13.0	9.2	10.0	6.8	8.6	10.8	15.8	18.8	20.6	12.9
06	15.2	15.8	15.3	11.9	9.7	9.5	6.3	7.8	10.1	15.7	18.6	19.9	12.5
07	15.6	15.4	16.6	11.3	9.9	11.9	6.0	7.5	10.6	14.4	16.7	17.4	12.5
08	16.2	15.3	16.4	12.2	10.4	12.8	6.5	8.4	10.7	13.1	16.3	15.1	12.7
09	16.2	16.0	17.9	13.6	11.7	13.6	7.8	9.3	11.4	13.2	15.2	14.8	13.4
10	17.5	16.2	18.9	14.1	12.9	14.8	8.9	11.2	12.5	14.2	16.6	15.8	14.5
11	18.7	17.2	19.8	15.2	13.1	16.5	10.4	14.0	13.9	14.2	17.9	17.4	15.7
12	19.8	18.5	20.7	17.1	14.8	17.4	11.3	14.2	14.5	15.1	18.8	17.8	16.7
13	19.1	20.6	21.6	18.6	16.2	19.0	13.4	14.7	15.7	16.3	19.5	18.3	17.9
14	18.8	21.6	21.8	19.5	15.7	19.4	13.7	16.7	16.3	17.0	21.3	19.9	18.5
15	18.2	22.6	22.1	19.7	16.3	20.7	14.4	16.1	17.3	17.7	21.1	19.7	19.0
16	17.4	22.5	22.8	20.2	17.7	20.8	14.6	16.5	18.6	17.1	19.9	19.3	19.2
17	17.2	20.6	22.0	20.2	17.2	20.9	13.8	16.8	18.0	16.2	19.6	18.6	18.7
18	15.3	20.4	19.9	18.8	16.9	20.2	14.1	16.1	15.3	15.6	19.6	19.2	17.9
19	15.5	20.0	18.0	17.3	14.9	18.7	14.7	14.3	14.9	15.0	19.1	19.2	16.9
20	15.8	20.3	18.1	15.7	13.1	17.3	13.9	13.6	14.9	15.5	20.2	18.0	16.3
21	16.3	19.1	17.4	15.1	13.4	15.0	12.5	13.0	14.6	15.0	21.7	19.9	15.8
22	15.8	18.3	17.3	15.1	11.6	14.3	10.4	11.5	14.0	16.0	20.6	21.5	15.2
23	16.1	18.4	16.3	14.0	10.8	14.6	9.4	10.7	13.4	16.1	20.1	20.7	14.7
24	16.7	18.1	15.5	13.5	10.8	13.6	8.6	10.0	13.0	15.6	19.8	19.9	14.2
Mean	16.9	18.5	18.3	15.4	12.8	15.3	10.3	12.0	13.6	15.4	19.3	18.9	15.4
Good Hours	720	972	1488	1387	1488	1440	1141	744	720	744	720	744	
Missing Hours	24	396	0	53	0	0	347	0	0	0	0	0	

12,308 Hours of Good Data 820 Hours Missing 93.8% Data Recovery

Table 5 – Mean Hourly Wind Speed (mph) at 49.5M agl

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 49.5M WIND SPEED (S) (MPH)

02/01/07 - 07/31/08

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02	17.1	18.8	17.0	14.6	10.7	12.3	8.8	10.2	12.1	14.9	21.5	21.6	14.5
03	17.6	18.6	17.1	12.9	10.0	11.1	7.8	9.1	12.0	15.6	20.1	20.7	13.9
04	17.8	17.9	17.0	14.0	9.1	10.8	6.8	8.7	11.4	16.3	20.3	20.7	13.7
05	16.9	16.7	16.1	13.5	9.4	10.2	7.1	9.1	11.2	16.5	19.4	21.3	13.4
06	15.6	16.4	16.1	12.3	9.8	9.7	6.7	8.3	10.4	16.3	19.3	20.4	12.9
07	15.8	15.9	17.2	11.6	10.0	12.0	6.4	7.9	10.9	15.0	17.2	17.8	12.9
08	16.7	15.9	17.0	12.5	10.5	12.9	6.8	8.7	11.0	13.7	16.8	15.6	13.0
09	16.7	16.5	18.4	13.9	11.7	13.7	8.1	9.6	11.6	13.7	15.4	15.3	13.7
10	17.8	16.7	19.4	14.4	12.8	14.9	9.2	11.5	12.7	14.2	16.9	16.3	14.7
11	19.0	17.6	20.2	15.5	13.0	16.6	10.7	14.2	14.0	14.2	18.3	17.8	15.9
12	20.1	19.0	21.2	17.3	14.7	17.2	11.5	14.3	14.6	15.2	19.2	18.2	16.9
13	19.3	21.2	22.1	18.9	16.0	18.9	13.5	14.8	15.8	16.5	19.9	18.6	18.1
14	19.1	22.2	22.3	19.8	15.6	19.4	13.9	16.7	16.3	17.1	21.7	20.4	18.7
15	18.6	23.3	22.6	19.9	16.2	20.7	14.6	16.1	17.2	17.8	21.5	20.2	19.2
16	17.8	23.1	23.4	20.5	17.5	20.8	14.7	16.5	18.6	17.2	20.4	19.9	19.4
17	17.6	21.2	22.7	20.5	17.1	20.9	14.0	17.0	18.0	16.5	20.3	19.2	19.0
18	15.8	21.2	20.7	19.1	16.8	20.1	14.4	16.4	15.7	15.8	20.1	19.8	18.2
19	15.9	20.8	18.7	17.8	15.0	18.8	14.9	14.7	15.2	15.2	19.6	19.8	17.3
20	16.2	21.1	18.8	16.2	13.2	17.5	14.2	14.0	15.3	15.9	20.8	18.6	16.7
21	16.6	19.8	18.2	15.5	13.5	15.2	12.7	13.4	14.9	15.3	22.4	20.6	16.3
22	16.1	18.9	18.1	15.4	11.5	14.6	10.8	12.0	14.3	16.4	21.4	22.4	15.6
23	16.6	19.1	17.0	14.4	10.9	14.8	9.7	11.1	13.8	16.4	20.9	21.4	15.1
24	17.2	18.8	16.2	13.9	11.0	13.9	9.1	10.6	13.3	15.9	20.4	20.6	14.6
Mean	17.3	19.2	18.9	15.8	12.8	15.4	10.6	12.3	13.9	15.7	19.8	19.4	15.8
Good Hours	720	972	1488	1387	1488	1440	1141	744	720	744	720	744	
Missing Hours	24	396	0	53	0	0	347	0	0	0	0	0	

12,308 Hours of Good Data 820 Hours Missing 93.8% Data Recovery

Table 6 – Mean Hourly Wind Speed at 49.5M agl

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 49.5M WIND SPEED (W) (MPH)

02/01/07 - 07/31/08

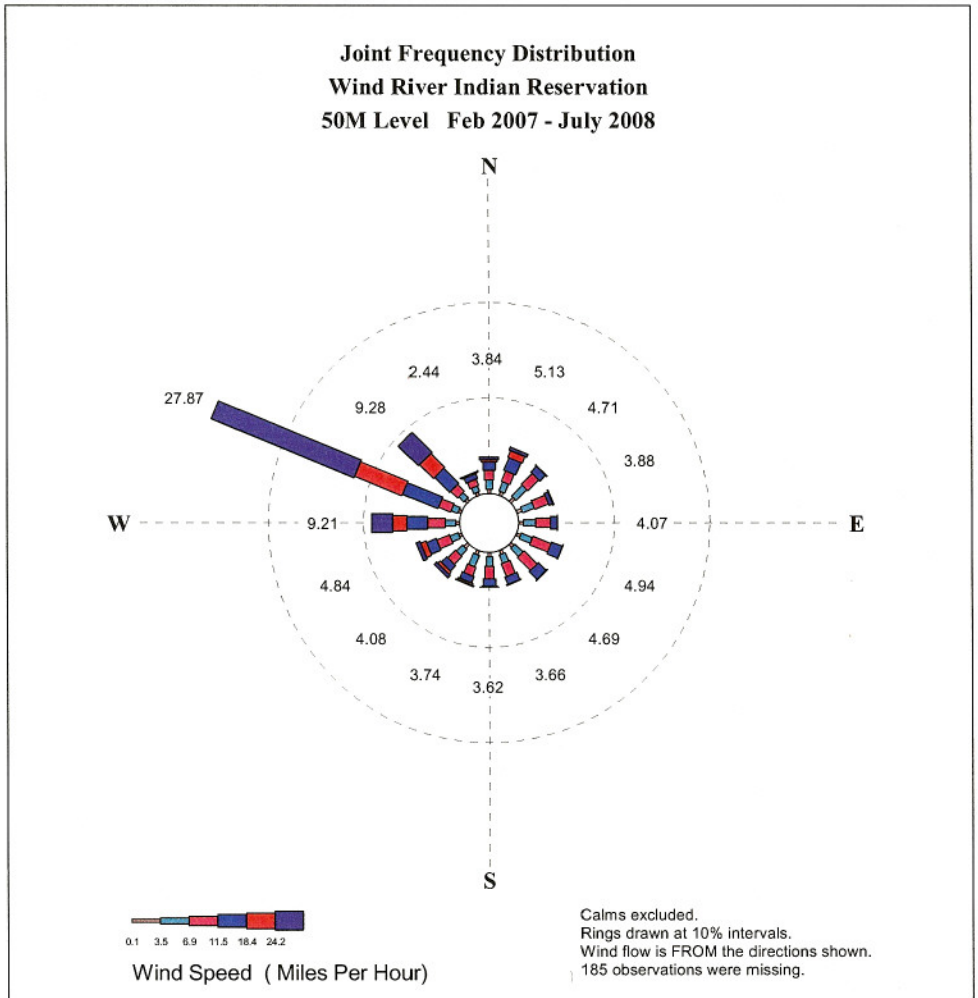
Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	17.6	18.8	17.0	14.7	11.5	13.2	8.5	10.2	12.8	15.3	21.8	19.8	14.7
02	17.5	18.9	17.1	14.8	10.9	12.6	9.0	10.3	12.4	14.7	21.6	21.7	14.7
03	18.0	18.7	17.1	13.1	10.2	11.3	7.9	9.3	12.3	15.5	20.2	20.8	14.0
04	18.2	18.0	17.1	14.1	9.3	11.0	7.0	8.8	11.6	16.1	20.4	20.8	13.8
05	17.3	16.9	16.2	13.6	9.6	10.4	7.2	9.2	11.3	16.4	19.5	21.4	13.5
06	16.1	16.5	16.1	12.5	10.0	9.9	6.8	8.3	10.6	16.1	19.3	20.5	13.1
07	16.3	16.1	17.3	11.7	10.1	12.2	6.4	8.0	11.0	14.8	17.3	18.0	13.0
08	17.1	16.1	17.0	12.6	10.5	13.1	6.8	8.7	11.0	13.4	16.9	15.8	13.1
09	17.0	16.6	18.4	13.9	11.8	13.9	8.1	9.6	11.6	13.4	15.6	15.5	13.8
10	18.2	16.7	19.4	14.3	13.0	15.1	9.2	11.4	12.7	14.3	16.9	16.6	14.8
11	19.4	17.6	20.2	15.5	13.2	16.8	10.7	14.2	14.1	14.3	18.2	18.0	16.0
12	20.5	18.9	21.2	17.4	14.9	17.6	11.7	14.5	14.8	15.2	19.1	18.3	17.0
13	19.7	21.1	22.1	18.9	16.3	19.4	13.7	15.0	16.0	16.5	19.9	18.7	18.3
14	19.5	22.2	22.2	19.8	15.8	19.7	14.1	17.0	16.6	17.2	21.6	20.5	18.9
15	19.0	23.2	22.5	20.0	16.4	21.1	14.8	16.4	17.6	17.9	21.5	20.4	19.3
16	18.2	23.1	23.3	20.5	17.8	21.2	15.1	16.8	18.9	17.4	20.5	20.1	19.6
17	18.0	21.2	22.7	20.5	17.4	21.3	14.2	17.2	18.4	16.6	20.3	19.4	19.2
18	16.3	21.2	20.7	19.3	17.1	20.6	14.6	16.7	15.9	16.0	20.3	20.0	18.4
19	16.4	20.9	18.8	18.1	15.3	19.3	15.2	15.0	15.6	15.4	19.8	19.9	17.5
20	16.7	21.2	18.9	16.5	13.5	18.1	14.7	14.2	15.6	16.0	20.9	18.8	17.0
21	17.1	19.9	18.2	15.7	13.7	15.8	13.2	13.6	15.2	15.4	22.5	20.8	16.5
22	16.6	19.1	18.1	15.7	11.9	15.1	11.0	12.2	14.6	16.5	21.5	22.5	15.9
23	16.9	19.2	17.1	14.6	11.1	15.3	10.0	11.3	14.1	16.5	20.9	21.5	15.3
24	17.6	18.9	16.3	14.1	11.2	14.2	9.2	10.7	13.6	15.9	20.5	20.8	14.8
Mean	17.7	19.2	19.0	15.9	13.0	15.8	10.8	12.4	14.1	15.7	19.9	19.6	15.9

Good Hours												
720	972	1488	1387	1488	1440	1141	744	720	744	720	744	

Missing Hours												
24	396	0	53	0	0	347	0	0	0	0	0	

12,308 Hours of Good Data 820 Hours Missing 93.8% Data Recovery

Figure 6 – Wind Rose for the Wind River Indian Reservation



PERCENT OCCURRENCE: Wind Speed (Miles Per Hour)
LOWER BOUND OF CATEGORY

DIR	0.1	3.5	6.9	11.5	18.4	24.2
N	0.42	0.99	0.98	0.88	0.29	0.28
NNE	0.44	1.02	1.17	1.41	0.75	0.34
NE	0.58	1.60	1.59	0.82	0.12	0.01
ENE	0.57	1.31	1.52	0.41	0.07	0.00
E	0.50	1.26	1.54	0.71	0.06	0.01
ESE	0.43	1.23	2.07	1.18	0.03	0.00
SE	0.39	1.19	1.90	1.15	0.06	0.01
SSE	0.40	0.94	1.45	0.83	0.04	0.00

TOTAL OBS = 12151 MISSING OBS = 185

PERCENT OCCURRENCE: Wind Speed (Miles Per Hour)
LOWER BOUND OF CATEGORY

DIR	0.1	3.5	6.9	11.5	18.4	24.2
S	0.44	1.00	1.29	0.80	0.07	0.02
SSW	0.48	1.29	0.98	0.69	0.21	0.09
SW	0.53	0.92	1.13	0.81	0.31	0.38
WSW	0.35	0.93	1.44	1.09	0.60	0.44
W	0.41	1.12	1.86	2.12	1.46	2.24
WNW	0.35	0.73	1.37	3.94	5.33	16.14
NW	0.36	0.75	1.00	2.18	2.08	2.91
NNW	0.38	0.61	0.69	0.53	0.12	0.12

CALM OBS = 0

Table 7– Turbulence Intensity

WIND RIVER RESERVATION
SHELDON DOME - 49.5M WIND SPEED (W)

02/17/07 to 07/17/08

Wind Speed Frequency and Concurrent TI

Wind Speed (mps)	Frequency of Occurrence Hrs	%	Mean Turbulence Intensity
0-2	1975	16.3	0.306
3	1537	12.6	0.202
4	1329	10.9	0.175
5	1156	9.5	0.158
6	841	6.9	0.154
7	648	5.3	0.142
8	608	5.0	0.129
9	545	4.5	0.125
10	539	4.4	0.120
11	512	4.2	0.116
12	435	3.6	0.117
13	441	3.6	0.114
14	384	3.2	0.110
15	351	2.9	0.108
16	260	2.1	0.106
17	184	1.5	0.103
18	141	1.2	0.106
19	93	.8	0.100
20	83	.7	0.105
21	36	.3	0.099
22	26	.2	0.094
23	12	.1	0.092
24	6	.0	0.092
25	6	.0	0.101
26	0	0.0	*****
27	1	.0	0.087
28	2	.0	0.096
29	0	0.0	*****
30	1	.0	0.078
Total Hrs	12152		12152

Hub Height Wind Speeds

Hub height wind speeds at 50-meters, 65-meters, 75-meters, and 80-meters are presented in Table 8. The wind speeds at 50-meters, 65-meters, 75-meters, and 80-meters are based on the 50-meter wind speed adjusted to a higher level using a wind speed power law exponent of 0.10.

Table 8 – Mean Annual Wind Speeds at the Wind River Indian Reservation for 50-meters, 65-meters, 75-meters, and 80-meters agl

Site	Height (Meters)	Shear	Average Wind Speed (mph)
Tower	50	-----	15.9
Tower	65	0.10	16.3
Tower	75	0.10	16.6
Tower	80	0.10	16.7

Turbine Selection

The four turbines proposed for analysis are the GE 1.5MW (77-m), Gamesa G87, Vestas V-90, and the Dewind 2.0. The potential peak wind speed in excess of 52.5 mps may limit this site to only IEC Class 1 wind turbines. The air density of the site, based on the annual average air temperature and elevation, is 0.98kg/m**3.

Theoretical Energy Output and Capacity Factor

The single turbine theoretical energy output (gross and net) and the single turbine gross and net capacity factors are presented in Table 9. A loss factor of 8% (i.e. 8% losses for availability, turbulence, line loss, blade contamination) is used to determine a net energy output and the net turbine capacity factor. The theoretical energy calculations are presented in Tables 10 through13. The wind speed frequency distribution for 30-meters above ground level (agl), 50-meters agl, and 80-meters agl is presented in Table 14.

Table 9 – Theoretical Energy Projections

Turbine	Rating (kW)	Hub Height (m)	Gross Output (kWh)	Gross Capacity Factor	Net Output	Net Capacity Factor
GE 1.5	1500	80	4,602,136	35.02%	4,233,965	32.22%
Gamesa G87	2000	80	6,069,918	34.65%	5,584,324	31.87%
Vestas V90	3000	80	7,602,427	28.93%	6,994,233	26.61%
DeWind	2000	80	5,526,912	31.55%	5,084,759	29.02%

Table 10- Theoretical Energy Output Calculation for the GE 1.5MW

Site: Wind River
Hub Height: 80-Meters
Turbine: GE 77
Density: 0.98kg/m**3

Wind Speed Bin (mps)	Frequency of Occurrence	Number of Hours	Power Curve (kW)	Energy (kWh)
0	0.30%	26	0.0	0
1	5.50%	482	0.0	0
2	8.60%	753	0.0	0
3	12.00%	1,051	0.0	0
4	10.80%	946	27.0	25,544
5	9.20%	806	97.0	78,174
6	7.50%	657	192.0	126,144
7	5.50%	482	325.0	156,585
8	5.00%	438	503.0	220,314
9	4.20%	368	734.0	270,053
10	4.30%	377	1001.0	377,057
11	4.30%	377	1227.0	462,186
12	3.60%	315	1379.0	434,881
13	3.70%	324	1441.0	467,057
14	3.20%	280	1500.0	420,480
15	3.20%	280	1500.0	420,480
16	2.50%	219	1500.0	328,500
17	1.80%	158	1500.0	236,520
18	1.50%	131	1500.0	197,100
19	1.20%	105	1500.0	157,680
20	0.70%	61	1500.0	91,980
21	0.70%	61	1500.0	91,980
22	0.30%	26	1500.0	39,420
23	0.20%	18	0.0	0
24	0.20%	18	0.0	0
25	0.00%	0	0.0	0
26	0.00%	0	0.0	0
27	0.00%	0	0.0	0
28	0.00%	0	0.0	0
29	0.00%	0	0.0	0
30	0.00%	0	0.0	0
		8760		
			Total kWh =	4,602,136
			Gross Capacity Factor =	35.02%
			Net Capacity Factor @8% Losses =	32.22%

Table 11 - Theoretical Energy Output Calculation for the Gamesa G87

Site: Wind River
Hub Height: 80-Meters
Turbine: Gamesa
Density: 0.98kg/m**3

Wind Speed Bin (mps)	Frequency of Occurrence	Number of Hours	Power Curve (kW)	Energy (kWh)
0	0.30%	26	0.0	0
1	5.50%	482	0.0	0
2	8.60%	753	0.0	0
3	12.00%	1,051	0.0	0
4	10.80%	946	57.7	54,589
5	9.20%	806	137.1	110,492
6	7.50%	657	258.9	170,097
7	5.50%	482	429.2	206,789
8	5.00%	438	651.6	285,401
9	4.20%	368	918.3	337,861
10	4.30%	377	1212.8	456,838
11	4.30%	377	1513.2	569,992
12	3.60%	315	1761.3	555,444
13	3.70%	324	1907.2	618,162
14	3.20%	280	1970.2	552,286
15	3.20%	280	1991.5	558,257
16	2.50%	219	1997.7	437,496
17	1.80%	158	1999.5	315,281
18	1.50%	131	1999.8	262,774
19	1.20%	105	2000.0	210,240
20	0.70%	61	2000.0	122,640
21	0.70%	61	2000.0	122,640
22	0.30%	26	2000.0	52,560
23	0.20%	18	2000.0	35,040
24	0.20%	18	2000.0	35,040
25	0.00%	0	2000.0	0
26	0.00%	0	0	0
27	0.00%	0	0	0
28	0.00%	0	0	0
29	0.00%	0	0	0
30	0.00%	0	0	0
		8760		
			Total kWh =	6,069,918
			Gross Capacity Factor =	34.65%
			Net Capacity Factor @8% Losses =	31.87%

Table 12 - Theoretical Energy Output Calculation for the Vestas V90

Site: Wind River
Hub Height: 80-Meters
Turbine: Vestas
Density: 0.98kg/m**3

Wind Speed Bin (mps)	Frequency of Occurrence	Number of Hours	Power Curve (kW)	Energy (kWh)
0	0.30%	26	0.0	0
1	5.50%	482	0.0	0
2	8.60%	753	0.0	0
3	12.00%	1,051	0.0	0
4	10.80%	946	53.0	50,142
5	9.20%	806	142.0	114,441
6	7.50%	657	281.0	184,617
7	5.50%	482	466.0	224,519
8	5.00%	438	714.0	312,732
9	4.20%	368	1027.0	377,854
10	4.30%	377	1330.0	500,984
11	4.30%	377	1656.0	623,782
12	3.60%	315	1963.0	619,052
13	3.70%	324	2258.0	731,863
14	3.20%	280	2539.0	711,732
15	3.20%	280	2778.0	778,729
16	2.50%	219	2925.0	640,575
17	1.80%	158	2983.0	470,359
18	1.50%	131	2997.0	393,806
19	1.20%	105	3000.0	315,360
20	0.70%	61	3000.0	183,960
21	0.70%	61	3000.0	183,960
22	0.30%	26	3000.0	78,840
23	0.20%	18	3000.0	52,560
24	0.20%	18	3000.0	52,560
25	0.00%	0	3000.0	0
26	0.00%	0	0	0
27	0.00%	0	0	0
28	0.00%	0	0	0
29	0.00%	0	0	0
30	0.00%	0	0	0
		8760		
			Total kWh =	7,602,427
			Gross Capacity Factor =	28.93%
			Net Capacity Factor @8% Losses =	26.61%

Table 13 - Theoretical Energy Output Calculation for the DeWind 2.0MW

Site: Wind River
Hub Height: 80-Meters
Turbine: Dewind
Density: 0.98kg/m**3

Wind Speed Bin (mps)	Frequency of Occurrence	Number of Hours	Power Curve (kW)	Energy (kWh)
0	0.30%	26	0.0	0
1	5.50%	482	0.0	0
2	8.60%	753	0.0	0
3	12.00%	1,051	0.0	0
4	10.80%	946	0.0	0
5	9.20%	806	32.5	26,192
6	7.50%	657	174.0	114,318
7	5.50%	482	344.0	165,739
8	5.00%	438	548.5	240,243
9	4.20%	368	785.5	289,001
10	4.30%	377	1045.0	393,631
11	4.30%	377	1326.5	499,666
12	3.60%	315	1612.0	508,360
13	3.70%	324	1825.5	591,681
14	3.20%	280	1943.5	544,802
15	3.20%	280	1994.0	558,958
16	2.50%	219	2000.0	438,000
17	1.80%	158	2000.0	315,360
18	1.50%	131	2000.0	262,800
19	1.20%	105	2000.0	210,240
20	0.70%	61	2000.0	122,640
21	0.70%	61	2000.0	122,640
22	0.30%	26	2000.0	52,560
23	0.20%	18	2000.0	35,040
24	0.20%	18	2000.0	35,040
25	0.00%	0	2000.0	0
26	0.00%	0	0	0
27	0.00%	0	0	0
28	0.00%	0	0	0
29	0.00%	0	0	0
30	0.00%	0	0	0
		8760		
			Total kWh =	5,526,912
			Gross Capacity Factor =	31.55%
			Net Capacity Factor @8% Losses =	29.02%

Table 14 – Wind Speed Frequency Distributions (Number of Hours) at 30-Meters, 50-Meters, and 80-Meters Above Ground Level

Wind Speed Bin (mps)	Percent Occurrence			Number of Hours		
	30-Meters	50-Meters	80-Meters	30-Meters	50-Meters	80-Meters
0	0.80%	1.10%	0.30%	70	96	26
1	5.70%	6.60%	5.50%	499	578	482
2	10.50%	10.50%	8.60%	920	920	753
3	13.60%	12.40%	12.00%	1191	1086	1,051
4	11.40%	10.90%	10.80%	999	955	946
5	9.60%	9.40%	9.20%	841	823	806
6	7.20%	6.60%	7.50%	631	578	657
7	5.60%	5.40%	5.50%	491	473	482
8	4.70%	4.90%	5.00%	412	429	438
9	4.60%	4.80%	4.20%	403	420	368
10	4.10%	4.20%	4.30%	359	368	377
11	3.70%	3.90%	4.30%	324	342	377
12	3.70%	3.90%	3.60%	324	342	315
13	3.50%	3.50%	3.70%	307	307	324
14	3.20%	3.40%	3.20%	280	298	280
15	2.30%	2.50%	3.20%	201	219	280
16	1.90%	1.90%	2.50%	166	166	219
17	1.40%	1.40%	1.80%	123	123	158
18	0.90%	1.00%	1.50%	79	88	131
19	0.70%	0.80%	1.20%	61	70	105
20	0.40%	0.40%	0.70%	35	35	61
21	0.30%	0.30%	0.70%	26	26	61
22	0.10%	0.10%	0.30%	9	9	26
23	0.10%	0.10%	0.20%	9	9	18
24	0.00%	0.00%	0.20%	0	0	18
25	0.00%	0.00%	0.00%	0	0	0
26	0.00%	0.00%	0.00%	0	0	0
27	0.00%	0.00%	0.00%	0	0	0
28	0.00%	0.00%	0.00%	0	0	0
29	0.00%	0.00%	0.00%	0	0	0
30	0.00%	0.00%	0.00%	0	0	0
	100%	100%	100%	8760	8760	8760

Mean Hourly Summaries
Wind River Indian Reservation

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 30M WIND SPEED (S) (MPH)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		17.4	16.5	12.1	9.5	10.1	7.2	9.6	11.8	14.3	20.8	18.7	13.2
02		17.3	16.6	12.5	9.2	10.0	7.6	9.9	11.5	13.7	20.3	20.5	13.3
03		15.6	16.7	11.1	8.9	9.1	7.0	8.9	11.5	14.5	19.0	19.7	12.7
04		13.4	17.2	12.5	8.3	9.5	6.1	8.3	10.9	14.8	19.2	19.7	12.7
05		13.0	16.4	12.5	8.0	9.4	6.0	8.6	10.6	15.2	18.2	20.3	12.5
06		11.5	16.8	11.5	8.2	8.9	5.9	8.0	10.0	15.0	18.0	19.5	12.2
07		13.0	17.3	11.8	8.4	10.4	5.8	7.9	10.5	13.9	16.1	17.3	12.0
08		13.0	16.2	13.4	9.4	11.6	6.5	8.9	10.9	12.8	15.9	15.1	12.1
09		14.1	17.4	15.0	11.5	12.3	7.7	9.7	11.7	13.0	15.0	14.6	12.8
10		14.0	18.6	14.9	13.0	13.6	8.1	11.5	12.6	13.8	16.7	15.7	13.8
11		15.4	19.0	16.0	12.6	14.6	9.4	14.1	14.0	14.1	18.0	17.4	14.9
12		20.4	20.3	17.2	14.7	15.0	10.4	14.3	14.6	15.0	18.8	17.8	16.0
13		22.3	20.9	18.0	17.0	16.4	12.5	14.9	15.8	16.3	19.4	18.4	17.2
14		26.1	20.8	18.7	15.7	16.3	12.8	16.8	16.4	16.9	21.2	20.0	17.9
15		25.9	21.7	18.5	16.2	18.4	12.9	16.2	17.4	17.5	21.0	19.5	18.2
16		27.1	22.7	19.0	17.8	19.2	13.2	16.6	18.6	16.8	19.5	19.1	18.6
17		27.8	21.6	17.8	17.4	20.3	12.6	16.9	17.9	15.7	19.1	18.4	18.1
18		26.5	19.1	17.4	16.9	19.8	12.5	16.0	15.1	15.0	19.1	18.9	17.3
19		26.7	16.6	15.8	14.3	17.4	13.5	14.0	14.4	14.4	18.7	18.7	16.2
20		25.6	17.7	14.1	12.3	16.9	13.2	13.2	14.3	14.8	19.7	17.7	15.8
21		22.7	16.9	12.7	11.8	15.0	12.0	12.8	14.2	14.4	21.1	19.5	15.3
22		19.7	17.2	13.3	10.5	14.4	10.5	11.3	13.5	15.3	20.0	21.1	14.9
23		19.9	16.3	13.0	9.1	14.6	9.5	10.6	12.9	15.6	19.6	20.4	14.4
24		19.3	15.5	12.3	8.9	12.4	8.0	9.9	12.7	15.1	19.5	19.6	13.6
Mean		19.7	18.2	14.6	12.1	14.0	9.6	12.0	13.5	14.9	18.9	18.6	14.8
Good Hours		276	744	667	744	720	744	744	720	744	720	744	
Missing Hours		396	0	53	0	0	0	0	0	0	0	0	

7,567 Hours of Good Data 449 Hours Missing 94.4% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 30M WIND SPEED (S) (MPH)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	16.3	17.5	15.2	15.3	12.1	14.2	9.3						14.6
02	16.2	17.6	15.5	15.2	11.3	13.2	9.8						14.4
03	16.7	18.0	15.3	13.4	10.2	11.7	8.5						13.7
04	17.2	18.1	14.8	14.0	9.1	11.0	7.7						13.4
05	16.1	16.9	13.4	13.1	9.8	10.4	8.6						12.8
06	15.0	16.9	13.2	12.1	10.7	10.0	7.6						12.5
07	15.5	15.9	15.5	11.2	11.3	13.6	7.7						13.3
08	16.1	15.9	16.6	11.9	11.6	14.5	8.2						13.9
09	16.2	16.8	18.7	12.8	11.9	15.2	9.4						14.8
10	17.5	17.3	19.6	13.8	12.6	16.1	11.5						15.7
11	19.0	18.2	20.9	14.9	13.5	18.3	13.0						17.1
12	20.1	18.1	21.5	17.4	14.8	19.6	13.7						18.2
13	19.4	19.8	22.5	19.4	15.1	21.6	15.5						19.3
14	19.1	20.0	22.9	20.7	15.5	22.4	16.0						19.8
15	18.3	21.4	22.6	21.2	16.2	23.1	17.8						20.2
16	17.3	20.5	23.0	21.6	17.1	22.4	17.8						20.1
17	17.1	17.3	22.3	22.3	16.8	21.4	16.4						19.3
18	14.9	17.6	19.9	19.6	16.3	20.1	17.2						18.0
19	15.2	16.7	18.5	17.9	14.5	19.0	16.0						16.9
20	15.6	17.4	17.6	16.5	12.8	16.3	14.0						15.9
21	16.1	17.0	16.9	16.6	13.9	13.8	12.2						15.4
22	15.6	17.1	16.8	16.1	11.6	13.1	9.6						14.6
23	15.9	17.1	15.6	14.4	11.6	13.5	8.8						14.2
24	16.3	16.9	15.0	14.1	11.9	14.0	9.8						14.3
Mean	16.8	17.7	18.1	16.1	13.0	16.2	11.9						15.9

Good Hours							
720	696	744	720	744	720	397	

Missing Hours							
24	0	0	0	0	0	347	

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 40M WIND SPEED (S) (MPH)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		18.2	17.0	12.5	9.7	10.4	7.2	9.8	12.3	14.8	21.3	19.1	13.6
02		18.3	17.1	12.9	9.4	10.4	7.7	10.0	11.9	14.2	21.0	20.9	13.7
03		16.3	17.1	11.4	9.2	9.3	6.9	8.9	11.9	15.0	19.6	20.1	13.1
04		14.1	17.6	12.7	8.5	9.8	5.9	8.4	11.3	15.4	19.8	20.1	13.0
05		13.6	16.9	12.7	8.3	9.5	5.8	8.8	11.0	15.8	18.8	20.8	12.9
06		12.0	17.3	11.6	8.3	9.0	5.8	8.0	10.2	15.6	18.6	20.0	12.4
07		13.4	17.6	11.7	8.3	10.4	5.5	7.8	10.8	14.4	16.7	17.4	12.1
08		13.4	16.4	13.3	9.3	11.5	6.1	8.7	11.0	13.1	16.3	15.2	12.1
09		14.2	17.4	15.0	11.4	12.3	7.4	9.6	11.7	13.2	15.2	14.8	12.8
10		14.0	18.6	14.9	13.0	13.6	7.9	11.4	12.7	14.2	16.8	15.9	13.9
11		15.6	19.0	16.1	12.7	14.8	9.3	14.2	14.1	14.2	18.1	17.5	15.0
12		20.6	20.4	17.4	14.8	15.1	10.4	14.3	14.7	15.2	19.0	17.9	16.1
13		23.6	21.0	18.2	17.2	16.5	12.5	14.9	15.9	16.5	19.7	18.5	17.3
14		26.6	20.9	18.8	15.9	16.4	12.9	16.9	16.5	17.1	21.5	20.1	18.0
15		26.4	21.8	18.6	16.4	18.6	13.0	16.3	17.5	17.7	21.3	19.8	18.4
16		27.7	23.0	19.1	18.0	19.4	13.2	16.7	18.8	17.1	20.0	19.5	18.8
17		28.8	22.0	18.0	17.6	20.5	12.7	17.1	18.2	16.2	19.7	18.7	18.5
18		27.6	19.7	17.8	17.3	20.2	12.7	16.4	15.5	15.5	19.7	19.3	17.8
19		28.0	17.1	16.4	14.8	18.0	13.8	14.5	15.0	14.9	19.2	19.2	16.7
20		26.9	18.3	14.7	12.7	17.8	13.6	13.7	15.0	15.3	20.3	18.1	16.4
21		24.0	17.7	13.1	12.3	15.8	12.4	13.2	14.7	14.9	21.9	20.0	15.9
22		20.8	17.8	13.7	10.8	15.2	10.8	11.7	14.0	15.8	20.8	21.7	15.5
23		20.8	16.8	13.4	9.4	15.3	9.6	10.9	13.4	16.0	20.3	20.9	14.8
24		20.2	15.9	12.6	9.1	12.9	8.0	10.2	13.1	15.5	20.0	20.1	14.0
Mean		20.4	18.5	14.9	12.3	14.3	9.6	12.2	13.8	15.3	19.4	19.0	15.1
Good Hours		276	744	667	744	720	744	744	720	744	720	744	
Missing Hours		396	0	53	0	0	0	0	0	0	0	0	

7,567 Hours of Good Data 449 Hours Missing 94.4% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 40M WIND SPEED (S) (MPH)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	16.8	18.0	15.6	15.7	12.3	14.9	9.6						15.0
02	16.7	18.0	15.9	15.6	11.4	13.7	10.2						14.8
03	17.2	18.4	15.8	13.8	10.2	12.1	8.7						14.1
04	17.6	18.4	15.1	14.5	9.2	11.2	7.8						13.7
05	16.6	17.2	13.9	13.5	9.8	10.5	8.8						13.1
06	15.3	17.3	13.4	12.4	10.8	10.0	7.6						12.7
07	15.8	16.2	15.7	11.2	11.2	13.6	7.6						13.4
08	16.5	16.2	16.6	11.8	11.4	14.4	8.0						13.9
09	16.5	16.9	18.7	12.7	11.8	15.1	9.2						14.8
10	17.7	17.4	19.6	13.8	12.5	16.1	11.6						15.8
11	19.0	18.2	20.9	14.9	13.4	18.4	13.2						17.1
12	20.1	18.1	21.6	17.4	14.8	19.9	13.9						18.2
13	19.4	19.8	22.7	19.5	15.1	21.9	15.8						19.4
14	19.1	20.0	23.1	20.8	15.5	22.7	16.3						19.9
15	18.4	21.6	22.8	21.2	16.2	23.3	18.1						20.4
16	17.6	20.8	23.2	21.7	17.2	22.6	18.1						20.3
17	17.4	17.5	22.6	22.5	16.8	21.6	16.8						19.5
18	15.3	17.9	20.4	20.0	16.5	20.5	17.6						18.4
19	15.6	17.0	19.0	18.4	14.9	19.6	16.8						17.4
20	15.9	17.8	18.1	17.0	13.2	17.0	14.8						16.3
21	16.5	17.3	17.3	17.0	14.2	14.3	12.7						15.8
22	15.9	17.4	17.1	16.6	11.9	13.6	10.0						15.0
23	16.3	17.5	16.0	14.8	11.9	14.1	9.3						14.6
24	16.9	17.3	15.3	14.5	12.2	14.5	10.1						14.7
Mean	17.1	18.0	18.3	16.3	13.1	16.5	12.1						16.2

Good Hours							
720	696	744	720	744	720	397	

Missing Hours							
24	0	0	0	0	0	347	

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 40M WIND SPEED (W) (MPH)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		18.0	16.9	12.4	9.6	10.3	7.2	9.6	12.2	14.8	21.2	19.0	13.5
02		18.1	17.0	12.8	9.3	10.3	7.6	9.8	11.8	14.3	20.9	20.8	13.6
03		16.2	17.0	11.3	8.9	9.3	6.9	8.8	11.7	15.0	19.6	19.9	13.0
04		14.0	17.5	12.7	8.1	9.7	5.9	8.2	11.1	15.5	19.7	20.1	12.9
05		13.5	16.8	12.6	8.2	9.4	5.8	8.6	10.8	15.8	18.8	20.6	12.8
06		11.8	17.2	11.6	8.3	8.9	5.7	7.8	10.1	15.7	18.6	19.9	12.4
07		13.2	17.6	11.7	8.2	10.2	5.3	7.5	10.6	14.4	16.7	17.4	12.0
08		13.4	16.3	13.1	9.1	11.3	5.9	8.4	10.7	13.1	16.3	15.1	12.0
09		14.0	17.3	14.8	11.3	12.2	7.2	9.3	11.4	13.2	15.2	14.8	12.7
10		13.7	18.4	14.7	12.9	13.5	7.6	11.2	12.5	14.2	16.6	15.8	13.7
11		15.4	18.8	15.9	12.6	14.6	9.0	14.0	13.9	14.2	17.9	17.4	14.9
12		20.3	20.1	17.2	14.7	14.9	10.0	14.2	14.5	15.1	18.8	17.8	15.9
13		23.3	20.8	17.9	17.1	16.3	12.2	14.7	15.7	16.3	19.5	18.3	17.1
14		26.1	20.8	18.4	15.8	16.2	12.6	16.7	16.3	17.0	21.3	19.9	17.8
15		25.9	21.7	18.2	16.3	18.4	12.7	16.1	17.3	17.7	21.1	19.7	18.2
16		27.2	22.8	18.8	18.0	19.2	13.0	16.5	18.6	17.1	19.9	19.3	18.6
17		28.3	21.8	17.8	17.5	20.4	12.4	16.8	18.0	16.2	19.6	18.6	18.3
18		27.1	19.7	17.7	17.2	20.0	12.5	16.1	15.3	15.6	19.6	19.2	17.6
19		27.5	17.1	16.2	14.7	17.8	13.6	14.3	14.9	15.0	19.1	19.2	16.6
20		26.4	18.3	14.5	12.8	17.6	13.5	13.6	14.9	15.5	20.2	18.0	16.3
21		23.6	17.6	13.1	12.2	15.6	12.3	13.0	14.6	15.0	21.7	19.9	15.8
22		20.5	17.7	13.6	10.8	15.0	10.6	11.5	14.0	16.0	20.6	21.5	15.3
23		20.5	16.7	13.2	9.3	15.1	9.5	10.7	13.4	16.1	20.1	20.7	14.7
24		20.0	15.8	12.4	9.1	12.8	8.0	10.0	13.0	15.6	19.8	19.9	13.9
Mean		20.1	18.4	14.7	12.2	14.1	9.5	12.0	13.6	15.4	19.3	18.9	15.0
Good Hours		276	744	667	744	720	744	744	720	744	720	744	
Missing Hours		396	0	53	0	0	0	0	0	0	0	0	

7,567 Hours of Good Data 449 Hours Missing 94.4% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 40M WIND SPEED (W) (MPH)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	16.7	17.9	15.5	15.6	12.7	14.8	9.4						15.0
02	16.5	18.0	15.7	15.4	11.8	13.8	10.0						14.7
03	17.0	18.4	15.8	13.6	10.5	12.2	8.3						14.0
04	17.3	18.4	15.2	14.2	9.6	11.3	7.4						13.7
05	16.4	17.2	14.0	13.4	10.2	10.5	8.5						13.1
06	15.2	17.3	13.5	12.3	11.2	10.0	7.3						12.7
07	15.6	16.2	15.6	10.9	11.6	13.5	7.2						13.3
08	16.2	16.1	16.5	11.5	11.7	14.3	7.6						13.8
09	16.2	16.8	18.6	12.4	12.0	15.0	8.8						14.6
10	17.5	17.2	19.5	13.4	12.8	16.0	11.2						15.6
11	18.7	18.0	20.7	14.6	13.6	18.3	13.0						16.9
12	19.8	17.8	21.3	17.1	14.9	19.8	13.7						18.1
13	19.1	19.5	22.4	19.2	15.2	21.8	15.5						19.2
14	18.8	19.7	22.8	20.6	15.6	22.5	15.8						19.7
15	18.2	21.3	22.4	21.0	16.3	23.1	17.7						20.2
16	17.4	20.6	22.8	21.5	17.3	22.4	17.8						20.1
17	17.2	17.4	22.3	22.4	17.0	21.3	16.3						19.3
18	15.3	17.7	20.1	19.9	16.7	20.3	17.3						18.3
19	15.5	16.9	18.9	18.4	15.1	19.5	16.7						17.3
20	15.8	17.7	18.0	16.9	13.5	17.0	14.8						16.3
21	16.3	17.2	17.1	16.9	14.5	14.4	12.9						15.8
22	15.8	17.4	17.0	16.5	12.3	13.7	9.8						14.9
23	16.1	17.5	15.9	14.7	12.2	14.0	9.2						14.6
24	16.7	17.3	15.2	14.5	12.6	14.4	10.0						14.7
Mean	16.9	17.9	18.2	16.1	13.4	16.4	11.9						16.1

Good Hours							
720	696	744	720	744	720	397	

Missing Hours							
24	0	0	0	0	0	347	

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 40M WIND SPEED (W) (MPH)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	16.7	17.9	15.5	15.6	12.7	14.8	9.4						15.0
02	16.5	18.0	15.7	15.4	11.8	13.8	10.0						14.7
03	17.0	18.4	15.8	13.6	10.5	12.2	8.3						14.0
04	17.3	18.4	15.2	14.2	9.6	11.3	7.4						13.7
05	16.4	17.2	14.0	13.4	10.2	10.5	8.5						13.1
06	15.2	17.3	13.5	12.3	11.2	10.0	7.3						12.7
07	15.6	16.2	15.6	10.9	11.6	13.5	7.2						13.3
08	16.2	16.1	16.5	11.5	11.7	14.3	7.6						13.8
09	16.2	16.8	18.6	12.4	12.0	15.0	8.8						14.6
10	17.5	17.2	19.5	13.4	12.8	16.0	11.2						15.6
11	18.7	18.0	20.7	14.6	13.6	18.3	13.0						16.9
12	19.8	17.8	21.3	17.1	14.9	19.8	13.7						18.1
13	19.1	19.5	22.4	19.2	15.2	21.8	15.5						19.2
14	18.8	19.7	22.8	20.6	15.6	22.5	15.8						19.7
15	18.2	21.3	22.4	21.0	16.3	23.1	17.7						20.2
16	17.4	20.6	22.8	21.5	17.3	22.4	17.8						20.1
17	17.2	17.4	22.3	22.4	17.0	21.3	16.3						19.3
18	15.3	17.7	20.1	19.9	16.7	20.3	17.3						18.3
19	15.5	16.9	18.9	18.4	15.1	19.5	16.7						17.3
20	15.8	17.7	18.0	16.9	13.5	17.0	14.8						16.3
21	16.3	17.2	17.1	16.9	14.5	14.4	12.9						15.8
22	15.8	17.4	17.0	16.5	12.3	13.7	9.8						14.9
23	16.1	17.5	15.9	14.7	12.2	14.0	9.2						14.6
24	16.7	17.3	15.2	14.5	12.6	14.4	10.0						14.7
Mean	16.9	17.9	18.2	16.1	13.4	16.4	11.9						16.1

Good Hours							
720	696	744	720	744	720	397	

Missing Hours							
24	0	0	0	0	0	347	

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 49.5M WIND SPEED (S) (MPH)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		18.9	17.7	12.9	9.9	10.6	7.6	10.2	12.6	15.3	21.7	19.6	14.0
02		19.0	17.8	13.3	9.6	10.6	8.0	10.2	12.1	14.9	21.5	21.6	14.1
03		17.1	17.8	11.8	9.5	9.5	7.2	9.1	12.0	15.6	20.1	20.7	13.5
04		14.7	18.3	13.1	8.8	10.0	6.2	8.7	11.4	16.3	20.3	20.7	13.4
05		14.1	17.7	13.0	8.6	9.6	6.1	9.1	11.2	16.5	19.4	21.3	13.3
06		12.5	18.1	11.9	8.6	9.2	6.1	8.3	10.4	16.3	19.3	20.4	12.8
07		13.9	18.3	12.0	8.4	10.3	5.7	7.9	10.9	15.0	17.2	17.8	12.4
08		13.9	17.0	13.4	9.3	11.4	6.2	8.7	11.0	13.7	16.8	15.6	12.3
09		14.5	17.8	15.1	11.4	12.2	7.5	9.6	11.6	13.7	15.4	15.3	13.0
10		14.2	18.9	15.0	13.0	13.5	8.0	11.5	12.7	14.2	16.9	16.3	14.0
11		15.8	19.3	16.2	12.6	14.6	9.3	14.2	14.0	14.2	18.3	17.8	15.1
12		20.8	20.7	17.4	14.6	14.8	10.3	14.3	14.6	15.2	19.2	18.2	16.1
13		23.9	21.3	18.2	17.0	16.1	12.4	14.8	15.8	16.5	19.9	18.6	17.3
14		26.9	21.2	18.8	15.8	16.1	12.8	16.7	16.3	17.1	21.7	20.4	18.0
15		26.8	22.2	18.6	16.2	18.3	12.9	16.1	17.2	17.8	21.5	20.2	18.4
16		28.2	23.4	19.2	17.9	19.1	13.2	16.5	18.6	17.2	20.4	19.9	18.9
17		29.4	22.5	18.2	17.4	20.2	12.6	17.0	18.0	16.5	20.3	19.2	18.6
18		28.3	20.5	18.0	17.1	19.9	12.8	16.4	15.7	15.8	20.1	19.8	18.0
19		28.9	17.9	16.8	14.8	17.9	13.9	14.7	15.2	15.2	19.6	19.8	17.0
20		27.8	19.1	15.1	13.0	18.0	13.8	14.0	15.3	15.9	20.8	18.6	16.8
21		24.8	18.5	13.6	12.6	15.8	12.6	13.4	14.9	15.3	22.4	20.6	16.3
22		21.5	18.6	14.0	11.0	15.3	11.0	12.0	14.3	16.4	21.4	22.4	15.9
23		21.5	17.6	13.7	9.6	15.4	9.8	11.1	13.8	16.4	20.9	21.4	15.2
24		21.0	16.6	12.9	9.4	13.1	8.4	10.6	13.3	15.9	20.4	20.6	14.4
Mean		21.0	19.1	15.1	12.3	14.2	9.8	12.3	13.9	15.7	19.8	19.4	15.4
Good Hours		276	744	667	744	720	744	744	720	744	720	744	
Missing Hours		396	0	53	0	0	0	0	0	0	0	0	

7,567 Hours of Good Data 449 Hours Missing 94.4% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 49.5M WIND SPEED (S) (MPH)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	17.2	18.6	16.1	16.1	12.7	15.1	9.9						15.4
02	17.1	18.7	16.3	15.9	11.8	14.1	10.4						15.2
03	17.6	19.2	16.4	14.0	10.5	12.6	8.7						14.5
04	17.8	19.1	15.7	14.8	9.5	11.6	7.9						14.1
05	16.9	17.7	14.6	13.9	10.1	10.7	8.9						13.5
06	15.6	17.8	14.1	12.7	11.1	10.2	7.8						13.1
07	15.8	16.7	16.2	11.2	11.6	13.8	7.6						13.6
08	16.7	16.7	16.9	11.8	11.6	14.5	7.9						14.1
09	16.7	17.2	19.1	12.8	11.9	15.2	9.1						14.9
10	17.8	17.6	19.9	13.8	12.6	16.2	11.4						15.9
11	19.0	18.3	21.2	14.8	13.4	18.5	13.1						17.1
12	20.1	18.3	21.8	17.2	14.8	19.7	13.8						18.2
13	19.3	20.0	22.9	19.5	15.1	21.7	15.6						19.4
14	19.1	20.3	23.4	20.7	15.4	22.6	16.0						19.9
15	18.6	21.8	23.0	21.2	16.1	23.1	17.8						20.4
16	17.8	21.0	23.4	21.7	17.1	22.5	17.6						20.3
17	17.6	17.7	22.9	22.6	16.8	21.5	16.5						19.6
18	15.8	18.3	20.8	20.1	16.6	20.3	17.6						18.6
19	15.9	17.5	19.6	18.7	15.2	19.6	16.9						17.7
20	16.2	18.4	18.6	17.3	13.5	17.1	15.1						16.7
21	16.6	17.8	17.8	17.2	14.5	14.7	13.1						16.2
22	16.1	17.9	17.7	16.7	12.1	13.9	10.3						15.3
23	16.6	18.0	16.5	15.0	12.1	14.3	9.6						14.9
24	17.2	17.9	15.8	14.8	12.5	14.6	10.5						15.0
Mean	17.3	18.4	18.8	16.4	13.3	16.6	12.2						16.4
Good Hours	720	696	744	720	744	720	397						
Missing Hours	24	0	0	0	0	0	347						

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 49.5M WIND SPEED (W) (MPH)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		18.7	17.6	12.8	10.0	10.7	7.6	10.2	12.8	15.3	21.8	19.8	14.0
02		18.8	17.7	13.3	9.7	10.6	8.0	10.3	12.4	14.7	21.6	21.7	14.2
03		16.9	17.7	11.8	9.5	9.6	7.3	9.3	12.3	15.5	20.2	20.8	13.5
04		14.6	18.2	13.1	8.8	10.0	6.3	8.8	11.6	16.1	20.4	20.8	13.4
05		14.0	17.6	13.0	8.7	9.6	6.1	9.2	11.3	16.4	19.5	21.4	13.3
06		12.3	18.0	11.9	8.7	9.2	6.1	8.3	10.6	16.1	19.3	20.5	12.9
07		13.7	18.2	11.9	8.5	10.4	5.7	8.0	11.0	14.8	17.3	18.0	12.4
08		13.8	16.9	13.3	9.3	11.5	6.1	8.7	11.0	13.4	16.9	15.8	12.3
09		14.2	17.7	15.0	11.5	12.3	7.5	9.6	11.6	13.4	15.6	15.5	13.0
10		13.8	18.8	14.9	13.1	13.7	7.9	11.4	12.7	14.3	16.9	16.6	14.0
11		15.5	19.2	16.1	12.8	14.8	9.3	14.2	14.1	14.3	18.2	18.0	15.1
12		20.5	20.5	17.4	14.9	15.1	10.3	14.5	14.8	15.2	19.1	18.3	16.1
13		23.5	21.1	18.1	17.3	16.5	12.5	15.0	16.0	16.5	19.9	18.7	17.4
14		26.5	21.0	18.7	16.0	16.4	13.0	17.0	16.6	17.2	21.6	20.5	18.1
15		26.4	22.0	18.5	16.5	18.6	13.0	16.4	17.6	17.9	21.5	20.4	18.5
16		27.8	23.2	19.1	18.2	19.4	13.4	16.8	18.9	17.4	20.5	20.1	19.0
17		29.1	22.4	18.1	17.7	20.6	12.8	17.2	18.4	16.6	20.3	19.4	18.7
18		28.0	20.4	18.0	17.5	20.3	12.9	16.7	15.9	16.0	20.3	20.0	18.2
19		28.6	17.8	16.8	15.2	18.4	14.1	15.0	15.6	15.4	19.8	19.9	17.2
20		27.6	19.0	15.1	13.3	18.4	14.1	14.2	15.6	16.0	20.9	18.8	16.9
21		24.6	18.4	13.6	12.8	16.4	12.9	13.6	15.2	15.4	22.5	20.8	16.5
22		21.4	18.4	14.1	11.3	15.7	11.2	12.2	14.6	16.5	21.5	22.5	16.0
23		21.3	17.4	13.7	9.8	15.7	9.9	11.3	14.1	16.5	20.9	21.5	15.3
24		20.8	16.5	12.9	9.5	13.3	8.5	10.7	13.6	15.9	20.5	20.8	14.5
Mean		20.7	19.0	15.1	12.5	14.5	9.9	12.4	14.1	15.7	19.9	19.6	15.5
Good Hours		276	744	667	744	720	744	744	720	744	720	744	
Missing Hours		396	0	53	0	0	0	0	0	0	0	0	

7,567 Hours of Good Data 449 Hours Missing 94.4% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
SHELDON DOME - 49.5M WIND SPEED (W) (MPH)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	17.6	18.8	16.4	16.4	13.0	15.6	10.2						15.7
02	17.5	18.9	16.6	16.2	12.1	14.6	10.8						15.5
03	18.0	19.4	16.5	14.3	10.9	13.0	9.1						14.8
04	18.2	19.3	16.0	15.1	9.9	12.0	8.2						14.4
05	17.3	18.0	14.9	14.2	10.4	11.1	9.2						13.8
06	16.1	18.1	14.3	13.0	11.3	10.6	8.0						13.4
07	16.3	17.0	16.4	11.5	11.7	14.1	7.8						13.9
08	17.1	16.9	17.0	11.9	11.7	14.8	8.1						14.3
09	17.0	17.5	19.1	12.9	12.0	15.4	9.4						15.1
10	18.2	17.8	20.0	13.8	12.9	16.5	11.7						16.1
11	19.4	18.4	21.3	14.9	13.6	18.7	13.4						17.4
12	20.5	18.3	21.9	17.4	15.0	20.2	14.1						18.5
13	19.7	20.1	23.0	19.6	15.2	22.2	16.0						19.6
14	19.5	20.3	23.3	20.9	15.6	23.0	16.4						20.1
15	19.0	21.9	23.0	21.4	16.3	23.6	18.3						20.6
16	18.2	21.1	23.4	21.9	17.4	22.9	18.3						20.6
17	18.0	18.0	22.9	22.8	17.0	22.0	17.0						19.9
18	16.3	18.4	20.9	20.6	16.8	20.9	17.9						18.9
19	16.4	17.6	19.7	19.2	15.3	20.3	17.3						18.0
20	16.7	18.6	18.8	17.8	13.7	17.8	15.7						17.1
21	17.1	18.0	18.0	17.7	14.7	15.2	13.7						16.5
22	16.6	18.1	17.9	17.2	12.6	14.5	10.6						15.7
23	16.9	18.3	16.8	15.5	12.5	14.9	10.1						15.3
24	17.6	18.1	16.0	15.3	12.9	15.1	10.7						15.4
Mean	17.7	18.6	18.9	16.7	13.5	17.0	12.5						16.7

Good Hours

720	696	744	720	744	720	397

Missing Hours

24	0	0	0	0	0	347

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
SHELDON DOME - 37M WIND DIRECTION (DEG)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		243	242	205	194	210	142	227	233	218	249	268	220
02		253	228	218	174	201	148	236	236	214	249	265	218
03		243	237	205	183	179	155	228	240	212	245	244	214
04		211	219	227	203	195	173	223	232	215	236	253	217
05		187	232	216	175	226	190	245	203	224	254	241	219
06		197	258	217	153	217	172	197	181	217	227	233	207
07		167	228	195	169	197	153	188	165	206	231	246	197
08		164	233	194	192	174	164	180	167	219	233	215	196
09		165	211	196	197	178	144	177	169	214	226	216	192
10		165	198	196	185	188	153	178	166	210	229	235	193
11		188	198	192	199	190	154	189	174	202	216	221	193
12		218	195	190	209	191	156	195	178	207	208	235	197
13		232	196	187	184	193	159	186	195	180	227	228	195
14		237	195	190	183	197	128	208	205	180	224	220	195
15		248	203	200	187	207	148	216	212	184	235	225	203
16		261	209	181	183	229	130	229	223	195	236	241	208
17		270	216	181	180	228	176	210	227	169	246	250	211
18		283	218	177	191	244	178	206	222	203	261	232	216
19		290	219	187	187	229	186	214	219	204	263	224	216
20		294	236	197	193	245	157	214	223	219	258	233	220
21		293	245	200	222	252	155	222	233	221	253	236	227
22		289	240	197	219	222	168	233	205	210	256	241	222
23		254	234	190	197	232	197	236	227	208	249	235	222
24		268	247	202	169	210	163	210	241	225	256	256	220
Mean		236	222	197	189	210	160	210	207	207	240	237	209
Good Hours		276	744	666	744	720	744	744	720	744	720	744	
Missing Hours		396	0	54	0	0	0	0	0	0	0	0	

7,566 Hours of Good Data 450 Hours Missing 94.4% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
SHELDON DOME - 37M WIND DIRECTION (DEG)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	242	247	242	233	199	215	245						231
02	241	207	239	246	185	220	253						226
03	216	232	250	243	206	191	255						226
04	220	209	261	232	192	209	288						226
05	220	214	231	241	174	222	221						217
06	212	214	229	214	187	190	223						209
07	211	218	238	198	173	189	165						201
08	227	200	227	192	178	198	175						201
09	212	213	219	180	192	202	185						201
10	232	216	215	199	213	220	183						213
11	201	209	219	188	206	217	192						205
12	234	211	191	202	186	221	201						207
13	208	222	197	209	192	227	219						210
14	201	215	209	198	187	237	179						205
15	217	228	202	216	175	249	198						213
16	213	222	196	185	175	257	203						207
17	213	219	192	195	180	243	197						206
18	234	206	196	216	150	245	192						206
19	252	213	221	238	181	244	197						222
20	235	214	251	246	212	220	162						224
21	223	238	235	246	183	199	206						219
22	223	225	242	265	189	232	195						226
23	230	241	249	248	215	221	226						233
24	249	254	237	224	193	226	204						228
Mean	224	220	224	219	188	221	207						215
Good Hours	720	696	744	720	744	720	397						
Missing Hours	24	0	0	0	0	0	347						

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
SHELDON DOME - 48.5M WIND DIRECTION (DEG)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		244	241	206	195	210	145	227	233	228	251	267	221
02		254	229	220	173	189	149	237	237	222	255	267	219
03		244	240	204	183	180	158	227	239	212	247	247	215
04		213	221	228	190	197	162	211	234	217	238	257	215
05		191	232	216	184	217	191	234	202	227	255	245	220
06		219	248	228	155	227	186	207	192	217	229	235	212
07		175	230	210	168	198	153	203	181	211	235	259	204
08		168	234	194	188	186	153	179	168	231	243	226	199
09		166	234	197	196	178	143	177	169	222	226	217	195
10		163	199	196	197	188	152	178	178	212	230	234	195
11		188	198	192	200	189	154	189	175	203	218	219	193
12		218	194	190	209	194	155	194	178	208	210	236	198
13		232	194	187	183	193	160	186	196	181	226	229	195
14		238	195	190	184	197	127	208	205	180	224	231	196
15		248	203	200	188	207	147	216	213	183	235	237	204
16		261	210	182	183	229	130	229	223	196	238	241	208
17		271	216	182	180	229	164	222	227	171	249	250	211
18		284	219	177	191	244	167	207	221	205	262	234	216
19		291	230	175	186	229	187	215	220	205	253	227	216
20		295	237	197	192	246	157	203	212	204	261	246	218
21		293	257	200	223	252	155	224	234	218	254	249	229
22		290	241	197	220	223	171	243	205	211	257	242	224
23		255	235	191	197	232	197	226	228	219	255	226	222
24		269	247	203	179	212	175	221	241	226	258	257	224
Mean		238	224	198	189	210	160	211	209	209	242	241	210
Good Hours		276	744	666	744	720	744	744	720	744	720	744	
Missing Hours		396	0	54	0	0	0	0	0	0	0	0	

7,566 Hours of Good Data 450 Hours Missing 94.4% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
SHELDON DOME - 48.5M WIND DIRECTION (DEG)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		244	241	206	195	210	145	227	233	228	251	267	221
02		254	229	220	173	189	149	237	237	222	255	267	219
03		244	240	204	183	180	158	227	239	212	247	247	215
04		213	221	228	190	197	162	211	234	217	238	257	215
05		191	232	216	184	217	191	234	202	227	255	245	220
06		219	248	228	155	227	186	207	192	217	229	235	212
07		175	230	210	168	198	153	203	181	211	235	259	204
08		168	234	194	188	186	153	179	168	231	243	226	199
09		166	234	197	196	178	143	177	169	222	226	217	195
10		163	199	196	197	188	152	178	178	212	230	234	195
11		188	198	192	200	189	154	189	175	203	218	219	193
12		218	194	190	209	194	155	194	178	208	210	236	198
13		232	194	187	183	193	160	186	196	181	226	229	195
14		238	195	190	184	197	127	208	205	180	224	231	196
15		248	203	200	188	207	147	216	213	183	235	237	204
16		261	210	182	183	229	130	229	223	196	238	241	208
17		271	216	182	180	229	164	222	227	171	249	250	211
18		284	219	177	191	244	167	207	221	205	262	234	216
19		291	230	175	186	229	187	215	220	205	253	227	216
20		295	237	197	192	246	157	203	212	204	261	246	218
21		293	257	200	223	252	155	224	234	218	254	249	229
22		290	241	197	220	223	171	243	205	211	257	242	224
23		255	235	191	197	232	197	226	228	219	255	226	222
24		269	247	203	179	212	175	221	241	226	258	257	224
Mean		238	224	198	189	210	160	211	209	209	242	241	210
Good Hours		276	744	666	744	720	744	744	720	744	720	744	
Missing Hours		396	0	54	0	0	0	0	0	0	0	0	

7,566 Hours of Good Data 450 Hours Missing 94.4% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
SHELDON DOME - 48.5M WIND DIRECTION (DEG)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	239	248	241	234	200	215	244						231
02	241	211	239	248	186	219	251						226
03	219	232	251	234	209	192	254						225
04	224	211	262	234	191	201	286						226
05	220	215	220	242	184	224	222						218
06	215	214	237	216	185	201	222						212
07	224	232	239	199	172	188	178						206
08	227	209	238	191	191	198	175						206
09	208	208	219	180	191	203	184						200
10	233	227	215	200	213	220	182						215
11	212	207	209	187	207	216	191						205
12	241	209	191	191	187	222	200						206
13	208	221	197	209	192	228	217						210
14	208	216	209	211	188	238	179						209
15	227	228	202	216	175	250	197						214
16	215	221	197	186	175	257	203						208
17	228	219	192	195	179	243	197						208
18	234	207	196	216	150	246	192						207
19	256	214	221	238	181	244	197						223
20	225	216	252	246	212	221	163						223
21	234	239	236	248	183	200	208						222
22	226	225	242	265	189	221	194						225
23	226	254	249	248	205	222	226						233
24	244	256	238	224	190	226	208						228
Mean	226	222	225	219	189	221	207						216
Good Hours	720	696	744	720	744	720	397						
Missing Hours	24	0	0	0	0	0	347						

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
SHELDON DOME - TEMPERATURE (DEG)

02/01/07 - 12/31/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		24.1	35.5	35.1	46.1	56.8	66.6	61.8	51.7	41.2	32.3	18.8	43.9
02		24.5	34.8	34.5	45.5	55.6	65.8	61.7	51.3	40.8	32.6	18.9	43.5
03		24.7	34.2	34.2	44.8	54.8	65.1	61.1	50.6	40.6	32.2	18.7	43.0
04		23.9	34.0	33.9	44.5	54.4	64.6	60.9	49.8	40.3	31.4	18.8	42.6
05		22.9	33.8	33.4	44.9	55.1	64.9	60.5	49.2	39.8	30.9	18.8	42.4
06		23.2	33.6	34.5	46.9	57.6	66.9	61.3	49.0	39.3	30.8	18.5	43.2
07		24.0	34.5	36.8	49.9	60.6	69.6	63.9	51.3	40.8	31.1	18.3	44.9
08		26.6	37.0	40.2	53.0	63.5	72.4	67.0	54.6	43.1	33.2	19.3	47.6
09		29.2	40.5	43.2	55.5	66.5	75.8	70.1	57.7	45.9	35.3	21.3	50.4
10		30.8	43.2	45.4	57.4	69.4	78.7	72.1	60.4	48.3	37.8	23.1	52.8
11		32.6	45.5	47.0	59.4	71.4	81.0	73.9	62.5	50.4	39.4	25.0	54.8
12		34.4	47.0	48.8	60.2	73.5	82.3	75.4	64.2	51.4	40.8	25.2	56.1
13		35.9	47.7	49.7	60.7	74.4	82.9	76.7	65.6	51.9	41.4	25.4	56.8
14		36.4	47.9	50.0	61.4	74.8	82.4	76.6	66.3	51.8	41.5	24.9	57.0
15		35.7	47.4	50.0	61.2	75.0	82.0	76.0	66.2	51.2	40.4	23.7	56.5
16		34.1	46.4	49.2	60.2	74.0	81.5	75.1	64.7	49.4	37.8	22.1	55.2
17		31.4	44.1	47.4	58.8	72.8	80.2	73.6	62.4	46.3	35.5	20.6	53.3
18		28.8	41.2	44.8	56.7	70.8	77.9	70.7	59.3	44.8	34.8	20.2	51.2
19		27.3	39.4	42.2	53.8	67.6	74.5	67.7	57.2	44.0	34.3	19.6	49.2
20		26.5	38.4	40.6	51.4	64.4	71.8	66.0	56.1	43.4	33.8	19.3	47.7
21		25.9	37.9	39.6	50.0	62.7	70.2	65.2	54.7	42.8	33.5	19.0	46.7
22		25.6	37.5	38.4	49.1	61.2	69.1	63.9	53.5	43.0	33.0	19.0	46.0
23		25.1	37.1	37.2	48.0	59.7	67.9	63.1	52.8	42.6	32.8	18.8	45.2
24		24.3	36.6	36.4	46.6	58.7	66.9	62.4	51.9	41.7	32.2	18.7	44.4
Mean		28.3	39.8	41.4	52.8	64.8	73.4	67.8	56.8	44.8	35.0	20.7	48.9
Good Hours		276	744	720	744	720	744	744	720	744	720	744	
Missing Hours		396	0	0	0	0	0	0	0	0	0	0	

7,620 Hours of Good Data 396 Hours Missing 95.1% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
SHELDON DOME - TEMPERATURE (DEG)

01/01/08 - 07/31/08

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	16.7	23.2	25.5	31.3	41.9	52.0	61.7						34.4
02	16.6	22.8	25.0	30.9	41.3	51.2	60.6						33.9
03	16.1	23.2	24.5	30.2	40.7	50.9	60.1						33.5
04	15.5	23.1	24.4	29.8	40.6	50.5	60.0						33.2
05	15.2	22.6	24.3	29.5	40.5	51.1	60.2						33.1
06	14.9	22.1	24.0	30.8	42.2	53.2	62.5						34.0
07	15.3	22.3	25.7	33.6	44.9	55.9	66.3						35.9
08	16.3	24.7	28.5	36.7	47.2	58.3	69.4						38.3
09	18.9	27.4	31.3	39.7	49.3	60.8	72.0						40.9
10	21.3	30.4	33.5	42.1	51.0	62.9	74.8						43.2
11	23.0	32.5	35.3	44.0	52.8	64.4	76.8						45.0
12	23.1	33.3	36.7	45.3	53.7	65.7	78.1						46.0
13	23.5	34.1	36.9	45.8	54.5	66.7	79.5						46.7
14	23.1	34.1	36.6	46.0	54.3	67.1	79.7						46.5
15	21.7	33.3	36.1	45.1	54.4	66.5	79.7						45.9
16	19.6	31.6	34.9	43.7	54.2	65.7	78.6						44.7
17	17.9	28.6	32.5	42.1	53.0	65.0	77.7						43.0
18	17.1	26.4	30.0	39.5	51.1	63.4	75.4						41.1
19	16.8	25.9	28.6	36.9	48.5	60.4	71.7						39.2
20	17.4	25.2	27.7	35.3	46.9	57.6	68.7						37.8
21	17.1	24.7	27.0	34.2	45.6	56.4	66.9						36.9
22	17.1	24.3	26.1	33.1	44.6	55.5	65.7						36.1
23	16.8	24.2	25.5	32.8	43.9	54.1	63.9						35.5
24	17.2	24.0	25.2	32.3	43.4	53.2	62.7						35.0
Mean	18.3	26.8	29.4	37.1	47.5	58.7	69.6						39.2

Good Hours							
720	696	744	720	744	720	397	

Missing Hours							
24	0	0	0	0	0	347	

4,741 Hours of Good Data 371 Hours Missing 92.7% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
33FT WIND SPEED (MPH)

09/01/06 - 02/28/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	11.7	17.4							13.4	14.8	12.3	12.1	13.2
02	12.0	16.2							11.5	12.4	10.9	11.6	12.2
03	12.2	15.4							10.3	11.1	9.6	11.1	11.4
04	11.0	14.4							9.0	10.8	9.4	10.3	10.7
05	9.8	12.1							7.4	10.9	10.3	9.8	10.2
06	10.3	11.4							7.8	10.8	10.9	9.8	10.3
07	10.1	10.4							8.4	10.0	9.9	10.1	10.0
08	9.9	10.4							9.1	9.6	10.2	10.4	10.0
09	10.2	10.4							10.5	9.5	9.6	11.7	10.3
10	9.1	10.9							11.3	8.4	9.4	10.0	9.6
11	8.7	12.2							11.9	9.4	8.5	10.3	9.7
12	8.7	11.6							11.5	11.2	9.4	11.5	10.4
13	8.3	14.4							10.6	10.2	9.4	11.3	10.3
14	8.8	13.2							9.8	10.8	8.8	10.7	10.1
15	8.1	15.9							12.5	10.2	8.4	9.6	10.0
16	8.6	16.5							14.1	9.2	8.0	9.5	10.0
17	9.2	16.1							14.2	8.8	7.6	9.3	9.9
18	9.2	15.8							12.1	8.8	9.3	9.0	10.0
19	9.2	15.2							14.0	9.9	10.4	8.8	10.4
20	10.4	16.8							13.4	10.7	11.7	9.3	11.3
21	11.1	19.6							12.8	11.9	13.2	11.2	12.7
22	11.1	20.2							13.6	13.5	13.8	13.2	13.7
23	11.9	20.0							14.6	14.0	14.6	13.9	14.3
24	12.6	20.1							15.3	13.8	14.4	13.4	14.3
Mean	10.1	14.9							11.6	10.9	10.4	10.7	11.1
Good Hours	744	360							239	728	687	744	
Missing Hours	0	312							481	16	33	0	

3,502 Hours of Good Data 842 Hours Missing 80.6% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
98 FT WIND SPEED (MPH)

09/01/06 - 02/28/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	13.2	18.9							14.7	16.5	14.5	14.0	15.0
02	13.6	18.0							12.8	14.4	13.2	13.8	14.1
03	13.7	17.2							11.9	13.0	11.9	13.3	13.4
04	12.3	16.3							10.7	12.7	12.0	12.3	12.6
05	11.2	13.8							8.4	13.0	12.9	11.8	12.1
06	11.9	12.9							8.4	12.8	13.4	12.0	12.3
07	11.6	12.2							9.7	12.1	12.4	12.6	12.0
08	11.5	12.0							10.5	11.6	12.5	12.7	12.0
09	12.0	12.0							12.5	11.5	12.0	13.9	12.3
10	10.8	12.5							13.6	10.4	11.7	12.5	11.6
11	10.6	14.3							13.9	11.3	10.8	12.7	11.8
12	10.2	13.4							13.5	13.1	11.9	13.9	12.5
13	9.6	16.6							12.5	12.2	12.2	13.5	12.4
14	10.5	15.3							11.7	12.6	11.0	13.0	12.1
15	9.7	18.1							14.6	12.3	10.4	11.5	11.9
16	10.4	18.7							16.2	11.0	10.1	11.6	12.0
17	10.7	17.7							15.6	10.0	9.8	11.5	11.6
18	10.5	17.2							13.2	9.9	11.4	10.9	11.5
19	10.2	16.6							15.2	10.9	12.2	10.3	11.7
20	11.5	17.9							14.7	11.6	13.4	10.8	12.6
21	12.1	21.2							14.0	13.0	14.9	12.6	14.0
22	12.1	21.7							14.9	14.7	15.7	14.8	15.1
23	13.1	21.5							16.0	15.2	16.6	15.5	15.8
24	14.0	21.7							16.8	15.1	16.6	15.2	16.0
Mean	11.5	16.6							13.2	12.5	12.7	12.8	12.9
Good Hours	744	360							239	728	687	744	
Missing Hours	0	312							481	16	33	0	

3,502 Hours of Good Data 842 Hours Missing 80.6% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
161 FT WIND SPEED (WEST) (MPH)

09/01/06 - 02/28/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	13.5	19.5							15.3	17.3	15.1	14.7	15.6
02	14.4	18.9							13.8	15.4	14.0	14.6	15.0
03	14.2	18.2							13.1	14.3	12.8	14.3	14.3
04	12.8	17.7							11.9	13.8	13.1	13.3	13.6
05	11.5	15.0							9.3	13.9	14.0	12.5	12.9
06	12.2	14.0							9.0	13.8	14.4	12.9	13.1
07	12.3	13.5							10.5	13.1	13.4	13.7	13.0
08	12.4	13.2							11.2	12.7	13.6	13.8	13.0
09	13.0	13.0							13.7	12.6	13.2	15.0	13.4
10	12.0	13.5							14.8	11.6	12.8	13.6	12.8
11	11.5	15.6							15.5	12.6	11.9	13.8	13.0
12	11.4	14.7							14.9	14.3	13.1	15.1	13.7
13	10.8	17.7							14.1	13.4	13.4	14.5	13.6
14	11.4	16.7							13.3	13.8	11.8	13.7	13.2
15	10.7	19.2							16.0	13.7	11.2	12.3	13.0
16	11.6	19.7							17.7	12.1	10.9	12.4	13.0
17	11.5	18.6							16.4	10.8	10.7	12.3	12.4
18	11.1	18.0							13.7	10.3	11.8	11.8	12.1
19	10.5	17.3							15.4	11.0	12.6	10.8	12.1
20	11.8	18.3							14.9	11.6	13.6	11.3	12.9
21	12.4	21.6							14.3	13.2	15.2	13.1	14.3
22	12.5	21.9							15.3	15.2	16.0	15.3	15.5
23	13.4	21.8							16.5	15.5	17.0	16.0	16.2
24	14.5	22.1							17.3	15.6	17.2	15.8	16.5
Mean	12.2	17.5							14.1	13.4	13.5	13.6	13.7
Good Hours	744	360							239	728	687	744	
Missing Hours	0	312							481	16	33	0	

3,502 Hours of Good Data 842 Hours Missing 80.6% Data Recovery

MEAN HOURLY WIND SPEEDS

WIND RIVER RESERVATION
161 FT WIND SPEED (SOUTH) (MPH)

09/01/06 - 02/28/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	13.4	19.4							15.6	17.4	15.3	14.7	15.6
02	14.3	18.9							13.9	15.5	14.1	14.7	15.1
03	14.2	18.1							13.2	14.5	13.0	14.4	14.4
04	12.9	17.5							11.9	14.0	13.4	13.5	13.8
05	11.6	15.1							9.3	14.1	14.3	12.8	13.1
06	12.2	14.1							9.0	14.0	14.7	13.2	13.3
07	12.1	13.6							10.6	13.3	13.7	14.0	13.1
08	12.4	13.3							11.4	12.8	13.8	14.0	13.1
09	13.0	13.0							14.0	12.7	13.5	15.3	13.6
10	12.1	13.6							15.2	11.7	13.0	13.9	13.0
11	11.6	15.8							15.9	12.8	12.1	14.0	13.2
12	11.5	14.8							15.2	14.6	13.4	15.3	13.9
13	10.9	18.0							14.4	13.7	13.6	14.7	13.8
14	11.4	16.8							13.6	14.1	12.1	13.9	13.3
15	10.8	19.4							16.3	13.9	11.4	12.4	13.2
16	11.7	19.9							17.8	12.3	11.0	12.5	13.1
17	11.6	18.7							16.4	11.0	10.8	12.5	12.6
18	11.1	18.3							13.7	10.5	12.1	11.9	12.2
19	10.4	17.4							15.4	11.2	12.7	10.9	12.2
20	11.6	18.2							15.0	11.9	13.7	11.4	12.9
21	12.3	21.6							14.5	13.3	15.4	13.1	14.4
22	12.4	21.7							15.5	15.3	16.3	15.3	15.6
23	13.3	21.7							16.9	15.7	17.2	16.1	16.3
24	14.3	22.1							17.6	15.7	17.4	15.8	16.5
Mean	12.2	17.5							14.2	13.6	13.7	13.8	13.8
Good Hours	744	360							239	728	687	744	
Missing Hours	0	312							481	16	33	0	

3,502 Hours of Good Data 842 Hours Missing 80.6% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
98 FT WIND DIRECTION (DEG)

09/01/06 - 02/28/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	193	191							149	171	214	217	195
02	193	196							169	189	206	228	200
03	210	196							140	171	234	239	206
04	237	199							160	185	247	243	220
05	256	198							202	209	267	257	239
06	248	235							207	208	272	272	245
07	233	245							220	226	274	279	250
08	256	280							252	232	273	274	260
09	237	255							280	216	266	263	249
10	247	259							281	234	270	267	257
11	217	256							290	241	262	252	247
12	228	256							292	246	258	261	252
13	229	205							264	226	247	266	239
14	203	266							258	240	231	267	240
15	222	270							266	238	231	245	240
16	228	268							243	234	222	256	239
17	220	228							251	217	214	246	227
18	198	237							194	216	240	236	222
19	179	224							192	198	222	222	206
20	194	192							168	183	217	228	201
21	172	199							150	168	217	200	187
22	186	208							163	157	216	206	191
23	182	207							148	161	214	193	187
24	191	216							159	167	237	201	198
Mean	215	229							213	205	240	242	225
Good Hours	744	360							239	725	687	723	
Missing Hours	0	312							481	19	33	21	

3,478 Hours of Good Data 866 Hours Missing 80.1% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
161 FT WIND DIRECTION (DEG)

09/01/06 - 02/28/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	188	193							150	172	215	221	196
02	172	196							174	183	207	234	197
03	196	195							141	174	225	235	202
04	218	194							162	175	267	253	220
05	223	200							175	202	269	270	232
06	229	241							202	213	279	276	245
07	243	237							220	223	277	283	252
08	239	264							263	222	276	279	256
09	231	273							269	206	274	269	249
10	228	256							286	238	263	273	253
11	221	256							287	242	270	260	251
12	232	266							298	250	265	252	254
13	213	232							271	244	256	258	243
14	227	276							249	245	236	254	245
15	222	279							237	254	237	264	248
16	224	276							246	250	234	258	245
17	239	265							250	232	242	252	244
18	206	252							194	219	236	230	223
19	201	229							192	214	228	242	220
20	210	211							169	187	220	231	209
21	191	205							153	181	218	197	194
22	193	210							164	159	219	190	190
23	193	208							149	164	221	198	192
24	192	216							160	171	240	203	200
Mean	214	235							211	209	245	245	227
Good Hours	744	360							239	725	687	744	
Missing Hours	0	312							481	19	33	0	

3,499 Hours of Good Data 845 Hours Missing 80.5% Data Recovery

MEAN HOURLY VALUES

WIND RIVER RESERVATION
TEMPERATURE (DEG)

09/01/06 - 02/28/07

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	21.0	34.4							57.3	50.0	39.8	30.4	36.5
02	18.6	31.2							55.2	47.3	37.0	28.6	34.2
03	18.3	29.5							52.5	45.5	35.8	27.8	32.9
04	17.7	28.4							50.8	44.4	35.1	27.2	32.1
05	17.3	27.8							49.5	43.3	34.4	26.6	31.4
06	17.1	26.9							48.7	42.5	33.4	26.3	30.8
07	17.0	26.2							47.9	41.8	32.9	25.9	30.3
08	16.6	26.1							46.7	40.9	32.9	25.5	29.8
09	16.5	25.7							46.5	40.3	32.0	25.4	29.4
10	16.0	25.4							46.0	39.7	31.5	24.5	28.8
11	15.4	25.7							45.4	39.4	31.2	24.3	28.5
12	14.9	25.8							44.9	39.1	30.8	23.9	28.2
13	14.3	26.3							44.8	38.7	30.5	24.0	28.0
14	14.9	26.5							44.6	38.1	30.7	23.8	28.0
15	14.7	26.8							44.5	37.2	30.9	23.3	27.7
16	14.7	27.5							46.1	38.4	31.5	23.2	28.2
17	15.6	28.7							49.2	40.7	33.2	23.5	29.6
18	17.5	30.7							52.9	43.2	35.6	25.3	31.9
19	18.9	32.7							56.2	45.4	38.1	28.1	34.2
20	20.8	34.1							57.8	47.2	40.4	30.6	36.2
21	21.4	35.8							59.3	48.6	42.2	32.3	37.6
22	22.0	37.3							60.2	49.5	43.0	33.3	38.5
23	23.0	38.0							60.2	50.1	43.3	33.7	39.0
24	22.7	37.6							59.9	50.1	42.5	32.2	38.4
Mean	17.8	29.8							51.1	43.4	35.4	27.1	32.1
Good Hours	744	360							239	744	687	744	
Missing Hours	0	312							481	0	33	0	

3,518 Hours of Good Data 826 Hours Missing 81.0% Data Recovery

Eastern Shoshone Tribe and Northern Arapahoe
on the Wind River Indian Reservation

Renewable Energy Development on Tribal Lands
DE-PS36-04GO94003

Appendix 2

Biological Screening Report

Sheldon Dome and Stagner Mountain Potential Wind Power Projects

Wind River Reservation, Wyoming

- Draft- August 28, 2007

Prepared for:

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Introduction

When exploring prospective wind power sites, knowledge of wildlife and other biological resource issues helps the wind industry identify and avoid potential ecological problems early in the development process. The Eastern Shoshone and Northern Arapaho Nations are currently examining the feasibility of constructing a wind power project on two potential sites in the Wind River Reservation, Wyoming (Figure 1). The purpose of this report is to describe biological resources present within and surrounding the proposed project areas, and to compare site characteristics with those at other wind power projects where post-construction wildlife studies are publicly available. The area evaluated for potential biological resources includes proposed project areas and a two mile buffer (evaluation areas). This report focuses on the following potential areas of concern:

- Raptors
  1. Identify areas of potentially high nesting density
  2. Identify areas of potentially high prey density
  3. Examine topography to determine the potential for high use and potential nest locations
  4. Determine the species likely to occur in the area
  5. Determine the potential for migratory pathways
- Candidate, Proposed, Threatened, Endangered, and USFWS Birds of Conservation Concern
  1. Identify the potential occurrence of federally listed or state protected species through existing literature and database searches
  2. Evaluate the suitability of habitat at the wind plant site for protected species
- Sensitive Species and USFWS Issues (using existing state wildlife agency information)
  1. Determine if site is considered a critical winter or parturition area or other highly valuable habitat for game and non-game wildlife (birds and bats)
  2. Examine habitat during site visits to determine the potential for use by sensitive species
- Migratory Birds
- Bats
  1. Determine the proximity to potential feeding sites and hibernacula
  2. Determine species likely to occur in the area
- Wetlands
  1. Determine the potential for wetlands at the site through a cursory site visit and examination of available data
- USFWS PII Score

Study Area

The two project areas are located on the Wind River Reservation. The proposed projects are preliminary, and the number and locations of turbines have not been determined.

Sheldon Dome. The project is located within the Wyoming Basin ecoregion (Omnerik 1987). The Wyoming Basin is characterized by broad valleys of grasslands and sagebrush, interspersed with mountain ranges. The proposed project area is dominated sparse stands of Wyoming sagebrush and broken grasslands (Figures 2-4). The area is dry with cold winters and relatively warm but short summers. The average annual precipitation is 7.2 inches, with an average high winter temperature of 25.6 F and an average summertime high of 88.1 F.

The proposed project would be located along a relatively broad, northwest – southeast running ridge. Some rim rock is present along some ridges. No perennial streams or lakes are present. The nearest water sources are a few stock tanks located within 2 miles of the project area. Elevation of the project area ranges from approximately 6700 – 7000 ft.

The project area is relatively undeveloped, and the primary land use in the area is grazing. Some active oil and natural gas wells are present within the evaluation area.

Stagner Mountain. The Stagner Mountain project is also located within the Wyoming Basin ecoregion (Omnerik 1987). The proposed project area is dominated grasslands and silver sagebrush (Figures 5-7). Side slopes in the project area contain coniferous forests, cliffs and rock outcrops. The area is dry with cold winters and relatively warm but short summers. The average annual precipitation is 7.2 inches, with an average high winter temperature of 25.6 F and an average summertime high of 88.1 F.

The proposed project would be located along a relatively stark ridge that is east – west in orientation. The ridge overlooks Boysen Reservoir and the Wind River Canyon. The nearest water sources are a few stock tanks and the Wind River, located within 2 miles of the project area. Elevation of the project area ranges from approximately 6700 – 7500 ft.

The project area currently has some development in the form of a Federal Aviation Administration (FAA) radar station, a power line and some radio towers. Cattle grazing is the current land use.

Methods

Biological resources within the project and evaluation areas were identified through a search of existing data and a site visit. The project area was examined from the ground on June 12-13, 2007. During the site visit, biological features and potential wildlife habitat including plant communities and topographic features were identified.

Several sources of available data were used to identify biological resources within the project area, including requesting data from the Wyoming Game and Fish Department (WGFD), the U.S. Fish and Wildlife Service (USFWS), Wyoming Natural Diversity Database (WYNDD), The Wind River Reservation and searching published literature, field guides, etc. The Wyoming Game and Fish Department declined to comment on the project because the Wind River Reservation is outside of their jurisdiction. Correspondence was received from WYNDD dated July 13, 2007 (Appendix A). At this time, no official correspondence has been received from the USFWS or the Wind River Reservation

After biological resources within the project area were identified, we compared the physical and habitat characteristics, as well species occurrence at the proposed project to other wind projects throughout the U.S., with a special emphasis on projects where post-construction wildlife studies have been conducted (Erickson et al. 2001 and 2002, NWCC 2004).

Results

Raptor Issues

Nesting density and species breeding in area. Potential nesting habitat for raptors in the Sheldon Dome project area is limited. The only areas of suitable habitat are a few outcrops located along the primary ridges, as well as some scattered conifer trees present within the evaluation area.

Potential nesting habitat is more prevalent within the Stagner Mountain project. A power line crosses the project area, which provides good nesting habitat for raptors. Other nesting habitat present near the project includes scattered coniferous forests and cliff habitat on the edges of the ridge and within Wind River Canyon.

Based on the range maps available from the Cerovski et al. (2004) and habitat within the project area, above ground nesting species most likely to breed in the proposed project and surrounding areas include the golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*) and American kestrel (*Falco sparverius*). The rim rock and cliffs provide suitable nesting habitat most of these species. Additionally, a few scattered trees are present in the project area that could provide suitable nesting habitat. The ferruginous hawk may also form nests on shallow rock outcrops or on the bare ground. Due to the presence of steep cliffs in Wind River Canyon, the potential exists for the peregrine falcon to nest within the Stagner Mountain evaluation area.

Turkey vultures (*Cathartes aura*) may occur within the project during the breeding season and may nest within the Stagner mountain project area. One red-tailed hawk nest and one ferruginous hawk nest were observed during the Stagner mountain visit (Figure 5) on a power line (Figure 8) and a nest platform (Figure 9). No nests were observed at

Sheldon Dome. The burrowing owl may nest within prairie dog burrows in the Stagner Mountain project area (Cerovski et al. 2004).

Raptors may also occur within the project areas outside of the breeding season, including golden eagle (*Aquila chrysaetos*), ferruginous hawk, red-tailed hawk and rough-legged hawk (*Buteo lagopus*) (WYNDD 2007).

To date, no correlation has been found between nesting densities within two miles of wind turbines and raptor fatality rates (Erickson et al. 2002). The project with the highest nesting density within two miles of wind turbines is Foote Creek Rim in Wyoming, and the majority of nests were occupied by red-tailed hawks. No red-tailed hawks were found as fatalities at Foote Creek Rim (Erickson et al. 2002). However, raptors nesting close to turbine locations may be at increased risk of collision or disturbance.

Potential for prey densities. White-tailed prairie dog (*Cynomys leucurus*) colonies are present within the proposed Stagner mountain project area. Although not observed during the site visit, the potential exists for white-tailed prairie dog colonies to also be present at the Sheldon Dome project. Less obvious species of small mammals are also likely present within and surrounding the project areas, such as lagomorphs (rabbits) and ground squirrels.

Based on the apparent presence of prairie dog colonies in portions of the Stagner project area, a sufficient prey base is present to serve as hunting areas for raptors in this project. Although no prairie dog colonies were observed at Sheldon Dome, other prey species may be present that could provide a prey base for hunting raptors.

Does the topography of the site increase the potential for raptor use? The proposed projects have varied topography, with some ridges being relatively steep with defined edges. At other wind power facilities located on prominent ridges with defined edges (e.g., rims of canyons, steep slopes), raptors often fly along the rim edges, using updrafts to maintain altitude while hunting, migrating or soaring (Johnson et al. 2000, Hoover and Morrison 2005). Turbines are often placed on prominent ridges in order to use higher wind speeds and updrafts that raptors also use. At Foote Creek Rim, raptors most often used areas within 50 m of the rim edge (Johnson et al. 2000). Topography in the both projects has some potential to influence raptor use, and ridges containing steep topography that are perpendicular to the wind are expected to receive higher levels of raptor use versus surrounding areas.

Federal Endangered Species

The USFWS describes 13 species protected under the Federal Endangered Species Act as having some potential to occur within Freemont or Hot Springs Counties, or as potentially being affected by water depletions to the South Platte River (Table 1). Of these 13 species, only the bald eagle is likely to occur within either project area.

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Table 1. Threatened or Endangered Species listed by the USFWS as occurring within Hot Springs and Freemont Counties, or that may be affected by upstream activities (Appendix B).

Species	Status	Primary Habitat	Potential for occurrence – Sheldon Dome	Potential for occurrence – Stagner Mountain
Bald Eagle	De-listed	Large bodies of fish bearing water	Low Potential. Evaluation area lacks water. May occasionally fly through project area	Medium Potential. Wind River provides suitable habitat, and prairie dog colonies provide potential hunting areas.
Black-footed Ferret	Endangered	Prairie Dog Colonies	Very Low. The project area has been block-cleared for wild black-footed ferrets by the USFWS.	Very Low. The project area has been block-cleared for wild black-footed ferrets by the USFWS. One historical record for black-footed ferrets is present within two miles of the project area (Figure 10).
Canada Lynx	Threatened	Coniferous Forests	Very Low. Project lacks suitable habitat.	Very Low. Project lacks suitable habitat.
Desert Yellowhead	Proposed for listing	Barren outcrops of the Split Rock Formation	Very Low. Only known to occur in one location in Freemont County.	Very Low. Only known to occur in one location in Freemont County.
Eskimo Curlew	Endangered	South Platte River	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.
Gray Wolf	Experimental – Non essential	Habitat Generalist	Low. Project located outside of current range, but potential exists for dispersing individuals to occur.	Low. Project located outside of current range, but potential exists for dispersing individuals to occur.
Grizzly Bear	Threatened	Mountains of Greater Yellowstone Region	Low. Project located outside of current range, but potential exists for dispersing individuals to occur.	Low. Project located outside of current range, but potential exists for dispersing individuals to occur.
Interior Least Tern	Endangered	South Platte River	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.
Pallid Sturgeon	Endangered	South Platte River	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.
Piping Plover	Threatened	South Platte River	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.

Table 1, continued. Threatened or Endangered Species listed by the USFWS as occurring within Hot Springs and Freemont Counties, or that may be affected by upstream activities (Appendix B).

Species	Status	Primary Habitat	Potential for occurrence – Sheldon Dome	Potential for occurrence – Stagner Mountain
Ute ladies'-tresses orchid	Threatened	Areas of low vegetation near permanent water sources	Low. Project lacks permanent water sources.	Low. Project lacks permanent water sources.
Western Prairie Fringed Orchid	Threatened	South Platte River	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.
Whooping Crane	Endangered	South Platte River	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.	Very Low. If project will cause water depletions, then impacts to this species will need to be addressed.

Bald Eagle. The Stagner Mountain project area provides limited nesting habitat for bald eagles, however, they likely utilize the area for hunting, when moving throughout home ranges, and during migration. The bald eagle is documented as nesting along the Wind River within 2 miles of the Stagner mountain site, and it is likely that bald eagles utilize the Wind River and surrounding areas for hunting throughout the year (Figure 10). Due to the presence of prairie dog colonies within the project area, there is increased potential for bald eagles to utilize the area while hunting.

Some potential also exists for bald eagles to form communal winter roosts near the proposed project area. The ridge where turbines would be placed lacks mature coniferous forest that could be used as winter roost locations, however, suitable forests are present just off the ridge within Wind River Canyon.

The Sheldon Dome site generally lacks suitable nesting, hunting and roosting habitat for bald eagles. However, it is likely that bald eagles occasionally fly through the Sheldon Dome project area during migration.

Sensitive Species and USFWS Issues

At this time, no official correspondence has been received from the USFWS stating their potential concerns with the proposed project. Many biologists in Wyoming are typically concerned with the potential effects of energy development on greater sage-grouse (*Centrocercus urophasianus*) and big game winter ranges. The proposed project occurs within winter ranges for pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*). Although the project is not within mapped ranges for big horn sheep (*Ovis canadensis*), this species is known to utilize the Wind River Canyon and the project area. Crucial winter ranges are thought to be important to big game winter survival, especially during severe winters. The proposed project areas are not listed as crucial ranges.

The proposed project areas also contain potentially suitable habitat for greater sage-grouse. During the site visit, one group of eight male greater sage-grouse was observed on the Stagner Mountain site. No greater sage-grouse were observed at Sheldon Dome, however, suitable nesting or foraging habitat is present within and surrounding the project area, and the potential exists for leks to occur within two miles of the project areas. Although this species is not protected under the Endangered Species Act, the greater sage-grouse has shown significant population declines over the last few decades. The USFWS recently expressed concern over the potential for greater sage-grouse to avoid wind turbines, and recommended wind turbines is placed at least 5 miles from any known greater sage-grouse leks (USFWS 2004).

The USFWS is also expected to be concerned with the potential direct (fatalities) and indirect (fragmentation and avoidance) impacts of the proposed project on birds and bats. Other species that are considered sensitive by some biologists have been recorded within two miles of the Stagner Mountain project area. While these species typically do not receive special protection, some biologist has expressed concern over the status of their populations. A map showing the species locations can be found in Figure 10.

Migratory Birds

Most species of migratory birds are protected by the Migratory Bird Treaty Act. The USFWS lists several species as birds of conservation concern within the Northern Rockies Bird Conservation Region (USFWS 2002). These species do not receive special protection (unless they are also listed by the USFWS), but have been identified as vulnerable to population declines in the area by the USFWS (2002). Due to the presence of native habitat in the project area, some of these species are likely to breed or winter within or adjacent to the project area, such as ferruginous hawk, golden eagle and loggerhead shrike (*Lanius ludovicianus*) (WYNDD 2007). For more information on the presence of birds of conservation concern in the project area, see Appendix C (USFWS PII score).

Although many species of songbirds migrate at night and may collide with tall man-made structures, no large mortality events on the same scale as those seen at communication towers have been documented at wind power facilities in North America (NWCC 2004). Large numbers of songbirds have collided with lighted communication towers and buildings when foggy conditions and spring or fall migration coincide. Birds appear to become confused by the lights during foggy or low ceiling conditions, flying circles around lighted structures until they become exhausted or collide with the structure (Erickson et al. 2001). Most collisions at communication towers are attributed to the guy wires on these structures, which wind turbines do not have. Additionally, the large mortality events observed at communication towers have occurred at structures greater than 500' in height (Erickson et al. 2001), likely because most birds migrate at elevations of 900' or higher (Young et al. 2004). Modern wind turbines are well below 900' in height. Migrating songbirds and other species are likely more at risk of turbine collision when ascending and descending from stopover habitats. Due to the presence of the Wind

River near the Stagner Mountain project, some potential exists for greater numbers of songbirds and other species to migrate through the areas and some potential exists for greater stopover events.

The average overall bird fatality rate at wind power projects in the U.S. is 2.3 bird fatalities per turbine per year or 3.1 bird fatalities per MW per year (NWCC 2004). Overall bird fatality rates documented at the Foote Creek Rim Wind Project were 1.5 per turbine per year (Young et al. 2003).

Bats

Species documented as occurring within the same latitude and longitude block of the project area include (Cerovski et al. 2004): western small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), little brown myotis (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), eastern red bat (*Lasiurus borealis*), Silver-haired bat (*Lasionycteris noctivagans*), Hoary Bat (*Lasiurus cinereus*), big brown bat (*Eptiscus fuscus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and pallid bat (*Antrozous pallidus*). The Townsend's big-eared bat has been documented within two miles of the proposed project area (WYNDD 2007).

The proposed Sheldon Dome project area generally lacks habitat features that attract foraging bats: water and trees. The Sheldon Dome project also appears to lack any roosting features that may attract bats. However, it is likely that bats migrate through the project area.

The proposed Stagner Mountain project site contains more habitat features that could attract bats. While the proposed ridge is an open grassland, located just off the ridge are mature coniferous forests, cliffs and potential caves that could provide potential roosting and foraging habitats for bats.

Bat casualties have been reported from most wind power facilities where post-construction fatality data are available. Reported estimates of bat mortality at wind power facilities have ranged from 0.01 – 47.5 per turbine per year (0.9 – 43.2 bats / MW / Year) in the U.S. with an average of 3.4 per turbine or 4.6 per MW (NWCC 2004). Bat fatality rates at Foote Creek rim were 1.34 per turbine per year (Young et al. 2003). Most of the bat casualties at wind power facilities to date are non-hibernating migratory species that conduct long-distance migrations between summer breeding and wintering areas, namely the hoary bat, eastern red bat and silver-haired bat (Johnson 2005). A recent report documented from 25 – 38 bat fatalities per turbine during a 6 week study period at wind power facilities in West Virginia and Pennsylvania. Most of the species killed were eastern red bat, hoary bat, and eastern pipistrelle (*Pipistrellus subflavus*) (Kerns et al. 2005). The West Virginia and Pennsylvania sites are located on prominent forested ridges in the Appalachian Mountains. The causes of the relatively high number of migratory bat deaths at wind power facilities are not well understood (Johnson 2005). Kerns et al. (2005) hypothesized that bats may have been attracted to turbines by

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The average overall bird fatality rate at wind power projects in the U.S. is 2.3 bird fatalities per turbine per year or 3.1 bird fatalities per MW per year (NWCC 2004). Overall bird fatality rates documented at the Foote Creek Rim Wind Project were 1.5 per turbine per year (Young et al. 2003).

Bats

Species documented as occurring within the same latitude and longitude block of the project area include (Cerovski et al. 2004): western small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), little brown myotis (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), eastern red bat (*Lasiurus borealis*), Silver-haired bat (*Lasionycteris noctivagans*), Hoary Bat (*Lasiurus cinereus*), big brown bat (*Eptiscus fuscus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and pallid bat (*Antrozous pallidus*). The Townsend's big-eared bat has been documented within two miles of the proposed project area (WYNDD 2007).

The proposed Sheldon Dome project area generally lacks habitat features that attract foraging bats: water and trees. The Sheldon Dome project also appears to lack any roosting features that may attract bats. However, it is likely that bats migrate through the project area.

The proposed Stagner Mountain project site contains more habitat features that could attract bats. While the proposed ridge is an open grassland, located just off the ridge are mature coniferous forests, cliffs and potential caves that could provide potential roosting and foraging habitats for bats.

Bat casualties have been reported from most wind power facilities where post-construction fatality data are available. Reported estimates of bat mortality at wind power facilities have ranged from 0.01 – 47.5 per turbine per year (0.9 – 43.2 bats / MW / Year) in the U.S. with an average of 3.4 per turbine or 4.6 per MW (NWCC 2004). Bat fatality rates at Foote Creek rim were 1.34 per turbine per year (Young et al. 2003). Most of the bat casualties at wind power facilities to date are non-hibernating migratory species that conduct long-distance migrations between summer breeding and wintering areas, namely the hoary bat, eastern red bat and silver-haired bat (Johnson 2005). A recent report documented from 25 – 38 bat fatalities per turbine during a 6 week study period at wind power facilities in West Virginia and Pennsylvania. Most of the species killed were eastern red bat, hoary bat, and eastern pipistrelle (*Pipistrellus subflavus*) (Kerns et al. 2005). The West Virginia and Pennsylvania sites are located on prominent forested ridges in the Appalachian Mountains. The causes of the relatively high number of migratory bat deaths at wind power facilities are not well understood (Johnson 2005). Kerns et al. (2005) hypothesized that bats may have been attracted to turbines by

ultrasound emissions, ephemeral increases in food sources, or bats may have investigated turbines for roosting sites or to glean insects from turbine blades. Researchers also theorized that clearings made in the forest for turbines and roads may have created attractive foraging areas for bats (Kerns et al. 2005).

At Foote Creek Rim, Wyoming, of 260 bats captured in mist nets in the vicinity of the wind farm, 81% were bats in the genus *Myotis*, with long-legged myotis (*Myotis volans*) and little brown bat being the most prevalent, yet members of this genus comprised only 6 (5%) of the 123 turbine collision mortalities during the study (Gruver 2002). Low mortality of *Myotis* and other bats in the area (i.e., big brown and silver-haired bat) occurred even though these species were documented within the wind plant. Although hoary bats comprised 88.1% of the fatalities, species other than hoary bats were responsible for 95% of all identifiable calls recorded at turbines with a bat detector.

Wetlands

Information concerning wetlands is based on field observations. Wetlands appeared to be rare in the project areas, and are limited to a few spring and well locations.

USFWS PII Score

The USFWS issued "Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines" in 2003. Application of the guidelines is voluntary. The guidelines are meant to assist the USFWS and the wind energy industry to locate projects to minimize or avoid wildlife impacts by providing a standardized approach to evaluate proposed project areas against other reference areas.

WEST personnel visited the proposed wind project area and completed the field portion of the interim guidelines (i.e., physical attribute checklist, ecological attractiveness checklist). Once in the office, WEST completed the remaining worksheets (i.e., species occurrence and status checklist) for determining the Potential Impact Index (PII) scores (Appendix C). The reference areas used for the evaluation were the Foote Creek Rim Wind Project and Hutton Lake National Wildlife Refuge.

The PII for the Sheldon Dome project was 130 and the Stagner Mountain project was 195. In contrast, the PII for the Foote Creek Rim was 133 and 205 for Hutton Lake National Wildlife Refuge. The Interim Guidelines state that a reference site should be selected such that it has a "maximum negative effect on wildlife." The Hutton Lake National Wildlife Refuge was selected for the reference site because it was a wildlife refuge located within Wyoming, would likely have a higher PII score than the project site, and have a high potential for negative impacts on wildlife. Foote Creek Rim was evaluated because it is an existing wind facility located in Wyoming.

Hutton Lake National Wildlife Refuge is publicly available land located in Wyoming but with more species, "better" habitat characteristics for some threatened and/or endangered species, serves a major migratory corridor and stopover habitat for birds and other

species, and is comprised largely of native habitat. In addition, the USFWS did not have any existing data on other PII scores within the state for comparison.

Conclusions

The potential for several biological resources to occur in the project areas were examined. Due to differences in topography and surrounding habitat, potential for occurrence differed between the two project sites. The potential for occurrence was considered low for some resources. The proposed projects have a relatively low potential for species protected under the Endangered Species Act to occur in the area, with the exception of the bald eagle. Both sites lacked any signs of wetlands.

The potential for other resources to occur was greater. Overall, the Stagner mountain site appeared to have more potential for biological resources than the Sheldon Dome site. Due to the presence of a steep ridge that could concentrate migrating and hunting raptors, the presence of a prey base in the form of prairie dog colonies, and the presence of suitable nesting habitat near the project, the Stagner Mountain site may have some characteristics that could lead to a greater potential for raptor fatalities. The Sheldon Dome area appeared to lack prairie dog colonies and highly suitable nesting habitat, and may have a lower potential for impacting raptors.

Both sites have potential for greater sage-grouse to occur on-site. Much debate has occurred recently regarding the potential impacts of wind power projects on prairie grouse. Under a set of voluntary guidelines, the USFWS has taken a precautionary approach and recommends wind turbines be placed at least five miles from known lek locations. The USFWS argues that because species such as greater sage-grouse evolved in open grassland or sage-brush habitats with little vertical structure, placement of tall man-made structures such as wind turbines in occupied greater sage-grouse habitat may result in a decrease in habitat suitability (USFWS 2004). Many researchers have hypothesized that greater sage-grouse avoid areas near power lines due to the tendency of power lines to create good perches for hunting raptors. Researchers have documented the negative effects of natural gas development and road traffic on nesting sage-grouse in Wyoming (Lyon and Anderson 2000, Holloran 2005). The creation of roads in the project area may negatively impact greater sage-grouse. Current research does not examine the level of avoidance of tall vertical structures by greater sage-grouse, however, the potential exists for greater sage-grouse to avoid areas near turbines.

The proposed projects will likely result in the mortality of some bat species during migration, including hoary bats and silver-haired bats. The vast majority of bat fatalities documented at the Foote Creek Rim and other projects occurred during the fall migration, and were composed of hoary bats and silver-haired bats (Young et al. 2003). Bat fatality rates observed at Foote Creek Rim were 1.34 per turbine per year, compared to a national average of 3.4 per turbine per year. The magnitude of these fatalities and the degree to which other bats species will be affected is difficult to determine. The Sheldon Dome project lacks habitats that may attract bats, such as water sources and trees. However,

potential caves, forests and rocky areas near the Stagner Mountain project area provide potential roosting and hibernacula. Studies conducted at other wind projects, including Foote Creek Rim, have documented use of the area by resident or breeding bats during the summer, however, these species are very rarely found as casualties at wind projects (Gruver 2002, Johnson 2005). We are unaware of any wind power facility located in areas containing mine shafts or caves that could provide roost sites for large numbers of wintering or breeding bats. Because few resident or breeding bat species have been documented as casualties at other wind projects, it is unclear if large numbers of resident or winter bat fatalities would occur if a wind power project is sited near a relatively large and well used hibernacula or maternity colony.

Similar to Foote Creek Rim, the proposed project contains some features that may result in increased raptor use or use by other species. Baseline studies at Foote Creek Rim were able to identify localized areas of high use in the project area, and small shifts in turbine locations likely reduced the potential impacts of the proposed project on raptors. If the proposed project proceeds, baseline studies can be utilized to identify high wildlife use areas to help design a wind project that reduces impacts to wildlife.

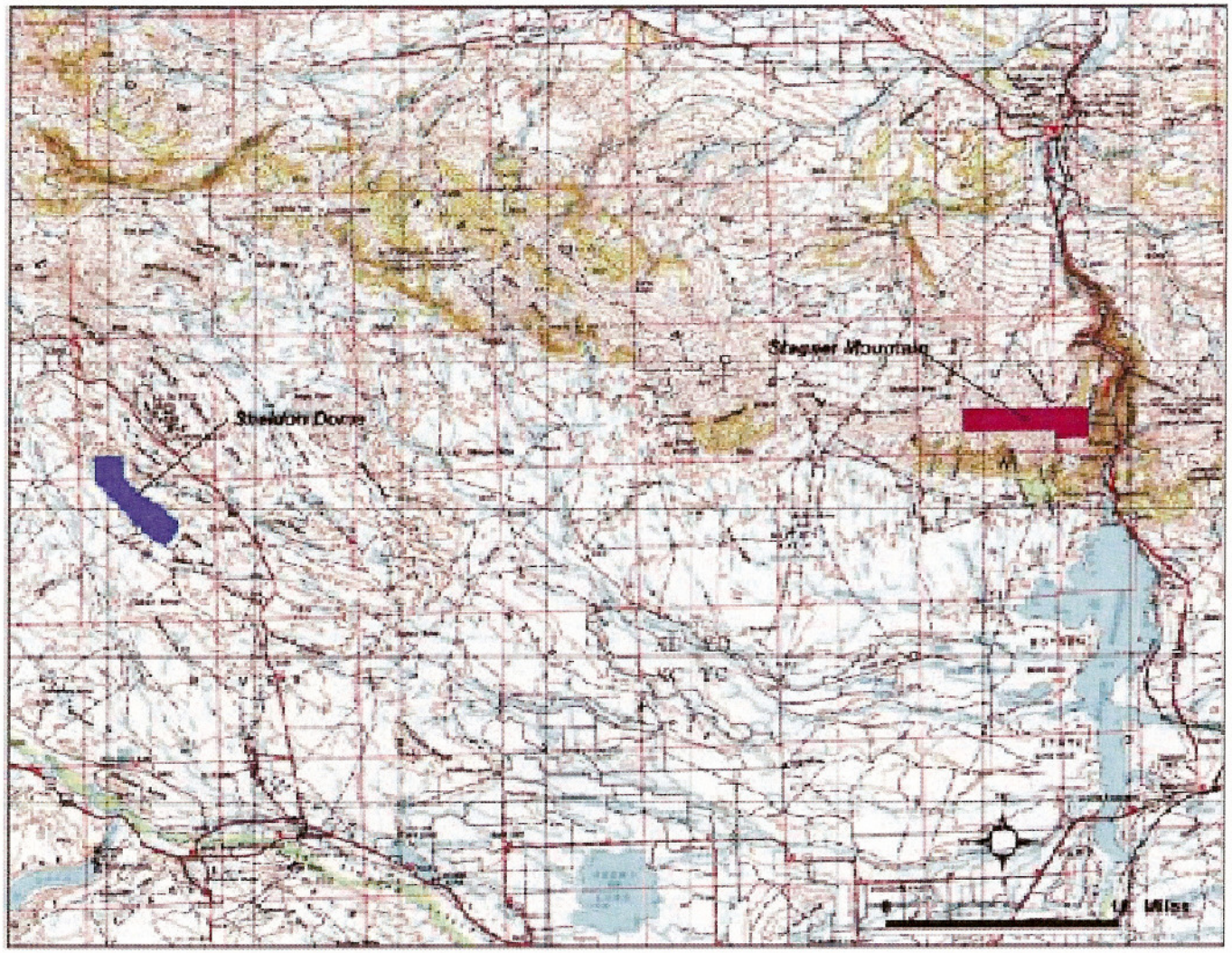

Figure 1. A map of the proposed project area.

Figure 2. Photographs of the Sheldon Dome site and surrounding landscape.

Figure 3. More photographs of the Sheldon Dome project and surrounding areas.

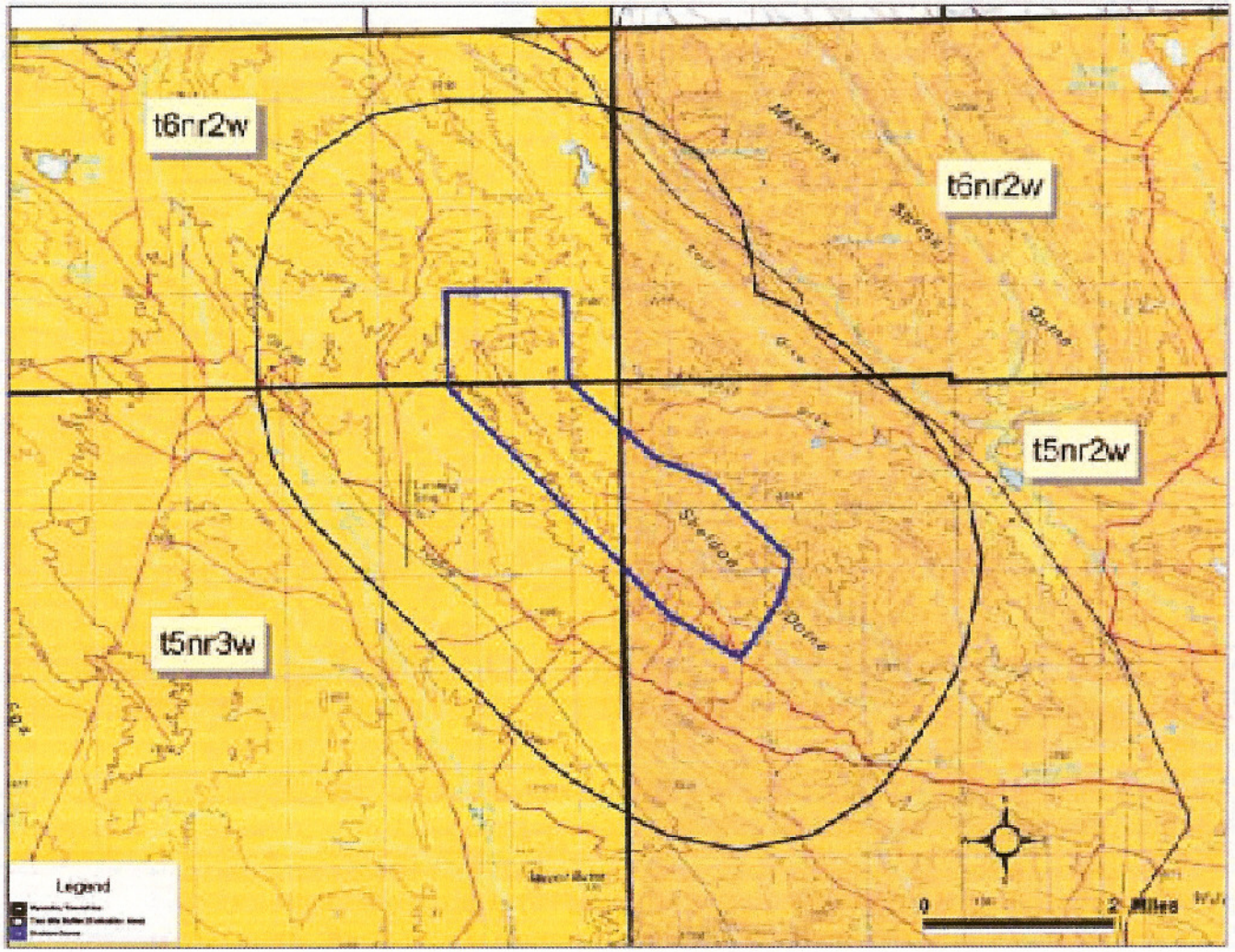

Figure 4. A topographic map of the Sheldon Dome project area.

Figure 5. Photographs of the Stagner Mountain project and surrounding areas.

Figure 6. More photographs of the Stagner Mountain Project and surrounding areas.

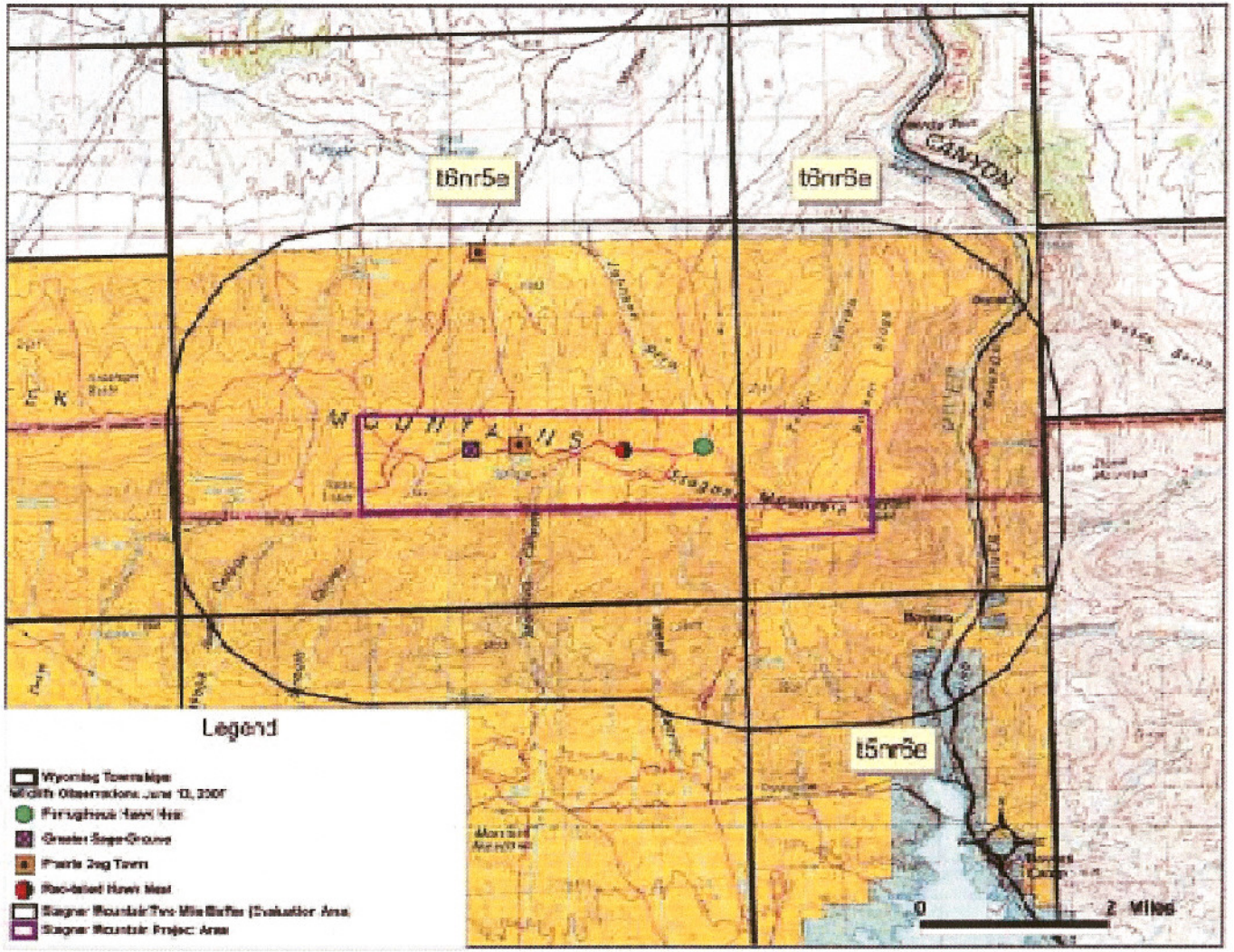

Figure 7. A topographic map of the Stagner Mountain project area.

Figure 8. A photograph of a ferruginous hawk nest located on a power line within the Stagner Mountain project area.

Figure 9. A photograph of a red-tailed hawk nest on a platform within the Stagner Mountain project area.

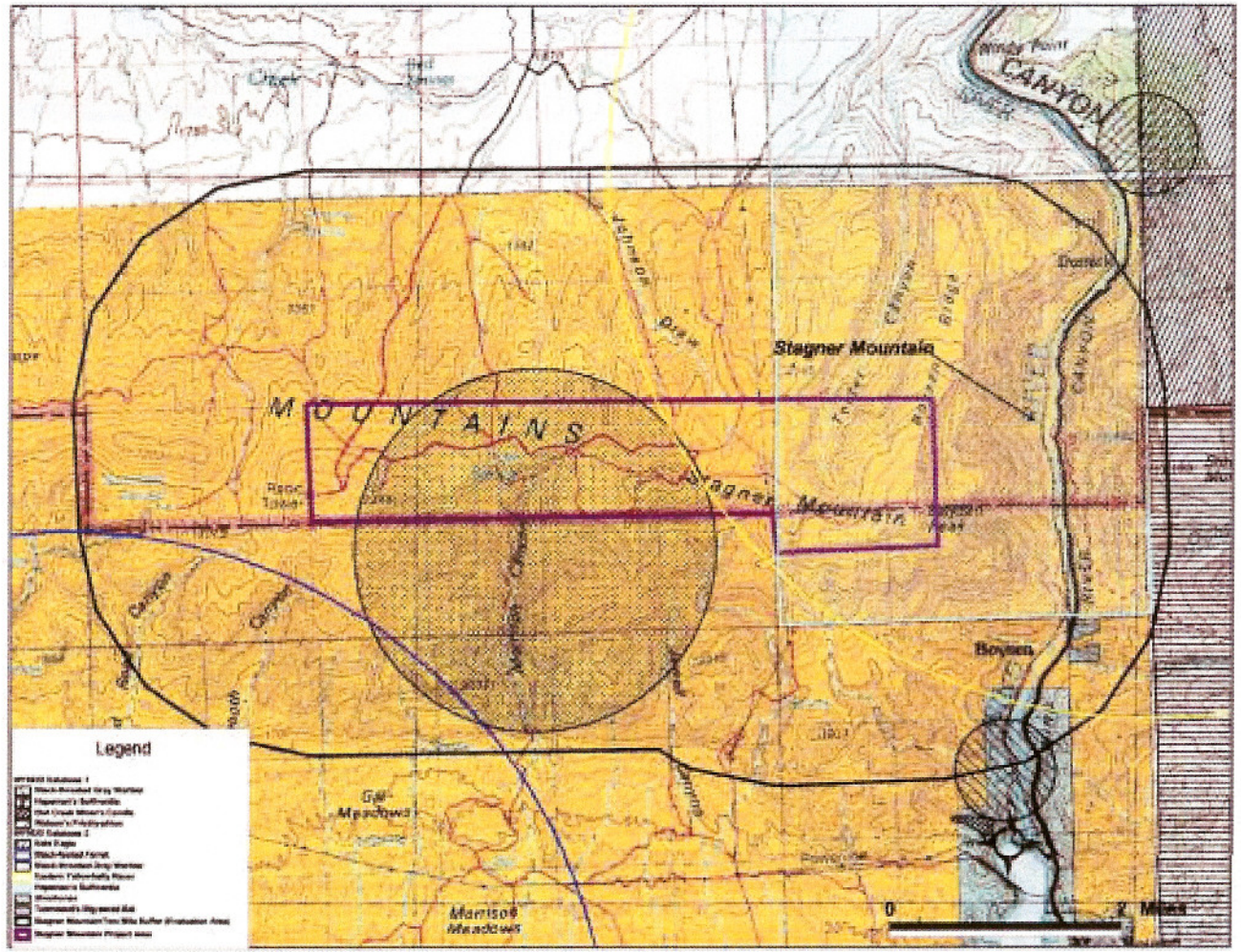

Figure 10. Wildlife records from the WYNDD (2007) within two miles of the Stagner Mountain project area. No records were present within two miles of the Sheldon Dome project.

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Appendix A – Correspondence from WYNDD concerning the proposed project areas.

Rhett Good

From: Melanie Arnett [Arnett@uwyo.edu]
Sent: Friday, July 13, 2007 1:20 PM
To: Rhett Good
Subject: data request results
Attachments: summary_supplement.xls; Shapefiles.zip

UNIVERSITY OF WYOMING
Wyoming Natural Diversity Database
Department 3381 • 1000 E. University Avenue • Laramie, WY 82071
(307) 766-3023 • fax (307) 766-3026 • e-mail: arnett@uwyo.edu • www.uwyo.edu/wyndd

Rhett Good
WEST, Inc.
2003 Central Avenue
Cheyenne, WY 82001

13 July 2007

Dear Rhett,

Attached are the results of your request for documented rare species occurrences in the northern half of the Wind River Indian Reservation, Fremont and Hot Springs Counties, Wyoming. A buffer of townships within 4 miles of the requested areas was also queried to provide adequate information for the appropriate application of these data (records distinguished by "Request" or "Buffer" in the Area field). An additional field, Eval_Area was included to distinguish between the Sheldon Dome area and the Stagner Mtn area.

Data are in the form of ArcView shapefiles in UTM Zone 12 NAD27. **The source.shp file now also contains data sensitive records as township polygons and may be considered complete data for this request; the eorep.shp file is included as a source of additional information for records in the source.shp file.** The shapefiles are attached in a .zip file. Because some email systems filter out emails with .zip attachments, please reply as soon as possible and let me know if you received this email and the attached data.

A summary of your results may be found in the Excel spreadsheet "summary_supplement.xls", which contains two worksheets:

1) a summary of your results by species and area (buffer or request, Sheldon Dome or Stagner Mtn) - if the species appears more than once it is because it is found in more than one area
2) a supplement for potentially truncated observation data in the source shapefiles

Please download a copy of our Data Dictionary at http://uwadmnweb.uwyo.edu/WYNDD/ if you have questions regarding file naming conventions, the definition of fields included in your shapefiles, or our data sensitive policy. We are currently in the process of altering our download protocol for source shapefiles so if you have questions please feel free to call me. Additional information about abbreviations in the shapefiles may also be obtained from the Codes and Definitions portion of this website.

Comments from our botanist, Bonnie Heidel (307-766-3020, bheidel@uwyo.edu), and zoologist, Doug Keinath (307-766-3013, dkeinath@uwyo.edu), will be forwarded to you as soon as they have an opportunity to review the requested area and formulate responses. These files provide further information regarding potential species occurrences in the area as well as habitat information. We have no documentation of vegetation communities that we track in the area of interest.

Recommended citation:
Wyoming Natural Diversity Database. 2007. Data compilation for R. Good, completed July 13, 2007. Unpublished

report. Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.

WYNDD would benefit greatly from the sharing of any new information on species locations that result from your project. Please contact us about our data trading policy, which would help your organization reduce costs while improving and updating our database.

We will send you a bill under separate cover for $99.75 (Tier 2 Data Request: 12 Townships x 625 taxa = 7500 (if between 6250-62500 then multiply by 0.0133 for fee)).

Thank you for your data request. Please do not hesitate to call if you have any questions about the search. We ask that you not disseminate these data without our permission.

Sincerely,

Melanie Arnett
Database Specialist
Wyoming Natural Diversity Database
University of Wyoming
217 Wyo Hall, Dept. 3381
1000 E. University Ave
Laramie, WY 82071-3381
Phone: 307.766.2296
Email: arnett@uwyo.edu
Web: http://www.uwyo.edu/wyndd

report. Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.

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We will send you a bill under separate cover for $99.75 (Tier 2 Data Request: 12 Townships x 625 taxa = 7500 (if between 6250-62500 then multiply by 0.0133 for fee)).

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Sincerely,

Melanie Arnett
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Phone: 307.766.2296
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ZOOLOGICAL COMMENTS

Wyoming Natural Diversity Database

Prepared for: Rhett Good - WEST, Inc.
Date: 16 July 2007
Project Description: Screening report for two potential wind projects (Sheldon Dome and Stagner Mtn) in portions of the northern half of the Wind River Indian Reservation, Fremont and Hot Springs Counties

HABITAT NOTES:

Towns: The Stagner Mtn site is between Thermopolis and Shoshoni and the Sheldon Dome site is approximately 35 miles east-southeast of Dubois.
Water: Teapot Wash, Fivemile Creek and Dry Creek intersect the Sheldon Dome site. Wind River, Stagner Creek, Gold Creek, Cottonwood Creek, and Big Wind River intersect the Stagner Mtn site.
Habitat: The Sheldon Dome site consists primarily of Wyoming Big Sage Steppe and Desert Shrub, with ribbons of Basin Rock & Soil and Shrub Riparian. The Stagner Mtn site consists primarily of Juniper, with some Mixed-Grass Prairie on the fringes. Other community types surrounding the sites include Douglas-fir, Forest Riparian, Greasewood, Irrigated Crops, Limber Pine, Mountain Big Sage, Open Water, and Saltbush.
Approximate Elevation: Sheldon Dome site: 6,200 - 7,000 ft.; Stagner Mtn site: 4,500 - 7,500 ft.

ZOOLOGY COMMENTS:

Please report new occurrences of any of these species to WYNDD so that our database continues to be current and useful to future requesters. Thank you!

These data represent what we currently have in our Biotics database as well as our informed opinion about what might occur in the request area if local habitat is appropriate (**species documented in our Biotics database are presented in bold face type**). Please note that absence of a species occurrence in our database is not proof that the species in question does not exist there. It is highly possible that people have never looked for, or reported, information on the species in question in the request area. Our data for private land is particularly sparse, so absence of observations on private parcels should be viewed with caution. Also, please note that (in general) only animals likely to breed or winter near the project area have been included in this list. Other animals, particularly migratory birds, may use portions of the study area in other seasons. Finally, this list includes only species that we actively track in our database, the full list of which can be found on our website (http://uwadmnweb.uwyo.edu/wyndd/).

Prepared by: Melanie Arnett, Database Specialist, arnett@uwyo.edu
Direct questions to: Doug Keinath, Zoologist; dkeinath@uwyo.edu

Bold = Documented in our Biotics database. * = Documented in buffer area only.

Sensitive BIRDS Documented or Potentially in Request Area				
Common Name	**Scientific Name**	**Heritage Rank**	**Management Status**	**Habitat Notes**
Common loon Stagner Mtn*	**Gavia immer**	**G5/S1B/S2N**	**S-USFS R4, WGFD CWCS, WGFD NSS1**	**Nests on medium to large lakes not disturbed by humans. During migration found on ponds, lakes and reservoirs**
Clark's grebe	Aechmophorus clarkii	G5/S1B	WGFD CWCS, WGFD NSS4	Ponds, lakes, and reservoirs
American white pelican (Breeding colonies)	Pelecanus erythrorhynchos	G3/S1B	WGFD CWCS, WGFD NSS3	Ponds, lakes, rivers, and reservoirs
American bittern	Botaurus lentiginosus	G4/S3B	S-USFS R2, WGFD CWCS, WGFD NSS3	Marshes and vegetated shorelines, esp. cattails and bulrushes
Snowy egret	Egretta thula	G5/S3B	WGFD CWCS, WGFD NSS3	Ponds, lakes, and reservoirs
Black-crowned night-heron	Nycticorax nycticorax	G5/S3B	WGFD CWCS, WGFD NSS3	Marshes and wooded streams
White-faced ibis	Plegadis chihi	G5/S1B	WY BLM SSL, WGFD CWCS, WGFD NSS3	Marshes, wet meadows, and vegetated shorelines
Trumpeter swan Sheldon Dome*	**Cygnus buccinator**	**G4/S2**	**USFWS ESA Listing Denied, WY BLM SSL, S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS2**	**Ponds, lakes, streams**
Tundra swan	Cygnus columbianus	G5/S2N		Ponds, lakes, and reservoirs
Ring-necked duck	Aythya collaris	G5/S4B		Rivers, lakes, reservoirs
Harlequin duck	Histrionicus histrionicus	G4/S1B	S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS3	Rapid mountain streams and rivers
Bufflehead Sheldon Dome*	**Bucephala albeola**	**G5/S2B**		**Lakes, ponds, rivers, reservoirs**
Common goldeneye Sheldon Dome*	**Bucephala clangula**	**G5/S3B**		**Lakes, rivers, and reservoirs**
Osprey	Pandion haliaetus	G5/S3B		Wooded areas along lakes and rivers
Bald eagle Sheldon Dome* Stagner Mtn	**Haliaeetus leucocephalus**	**G4/S3B/S5N**	**USFWS ESA Threatened (T, AD), WGFD CWCS, WGFD NSS2**	**Wooded areas usually along rivers, lakes, reservoirs. Sometimes in open country**
Northern goshawk Sheldon Dome*	**Accipiter gentilis**	**G5/S3**	**USFWS ESA Listing Denied, WY BLM SSL, S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS4**	**Open montane conifer forest or aspen**
Ferruginous hawk Sheldon Dome*	**Buteo regalis**	**G4/S4B/S5N**	**WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS3**	**Open grasslands and shrublands**
Golden eagle Sheldon Dome* Stagner Mtn*	**Aquila chrysaetos**	**G5/S3B**		**Open grasslands and shrublands esp. around cliffs and canyons**
Merlin Sheldon Dome*	**Falco columbarius**	**G5/S4**	**WGFD CWCS, WGFD NSS3**	**Open woodlands, grasslands, and shrublands sometimes in cities in winter**
American peregrine falcon	Falco peregrinus anatum	G4/T3/S2	USFWS ESA Delisted (DM), WY BLM SSL, S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS3	Mountainous zones or cliffs near large lakes and rivers
Greater sage grouse Sheldon Dome*	**Centrocercus urophasianus**	**G4/S4**	**USFWS ESA Petitioned, WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS2**	**Sagebrush basins and foothills, generally close to water**
Virginia rail	Rallus limicola	G5/S3B	WGFD CWCS, WGFD NSS3	Densely vegetated marshes, esp. cattails and bulrushes
Sandhill crane	Grus canadensis	G5/S3B/S5N	WGFD CWCS, WGFD NSS3	Meadows, marshes, shorelines, and grain fields

Bold = Documented in our Biotics database. * = Documented in buffer area only.

Whooping crane	Grus americana	G1/SAB/S1N	USFWS ESA Endangered (E, EXPN)	Wet meadows, marshes, and shorelines
Snowy plover	Charadrius alexandrinus	G4/SA		Sandy beaches and shores of alkaline ponds
Piping plover	Charadrius melodus	G3/SA	USFWS ESA Threatened (T)	Sandy beaches
Mountain plover Stagner Mtn*	**Charadrius montanus**	**G2/S2**	**USFWS ESA Listing Denied, S-USFS R2, WGFD CWCS, WGFD NSS4**	**Sparse shortgrass or mixed grass prairie. Also in short-sagebrush plains. Often associated with prairie dog towns.**
Black-necked stilt	Himantopus mexicanus	G5/S3B		Marshes, ponds, and shores
American avocet	Recurvirostra americana	G5/S3B		Marshes, ponds, and shores, esp. alkaline areas
Long-billed curlew	Numenius americanus	G5/S3B	WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS3	Meadows, pastures, shorelines, and marshes
Red-necked phalarope	Phalaropus lobatus	G5/S3N		Ponds, shorelines, and wet meadows
Ring-billed gull (Breeding colonies)	Larus delawarensis	G5/S2		Lakes, reservoirs, fields, garbage dumps, and wet meadows
California gull (Breeding colonies)	Larus californicus	G5/S2B		Lakes, reservoirs, wet meadows, fields, and garbage dumps
Herring gull (Breeding colonies)	Larus argentatus	G5/SA		Lakes, reservoirs, wet meadows, and fields
Caspian tern	Sterna caspia	G5/S1	WGFD CWCS, WGFD NSS3	Lakes, reservoirs, and rivers
Common tern	Sterna hirundo	G5/S1		Lakes and reservoirs
Forster's tern	Sterna forsteri	G5/S1	WGFD CWCS, WGFD NSS3	Lakes, reservoirs, and marshes
Black tern (Breeding colonies)	Chlidonias niger	G4/S1	S-USFS R2, WGFD CWCS, WGFD NSS3	Ponds, lakes, reservoirs, and marshes
Black-billed cuckoo	Coccyzus erythropthalmus	G5/S2		Deciduous woods and thickets, usually along large streams
Yellow-billed cuckoo	Coccyzus americanus	G5/S1	USFWS ESA Candidate (C), WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS2	Deciduous woods and thickets, usually along large streams
Short-eared owl Sheldon Dome*	**Asio flammeus**	**G5/S2**	**S-USFS R2, WGFD CWCS, WGFD NSS4**	**Open grasslands, meadows, marshes, and farmland, especially around tall grass or weeds**
Western screech owl	Otus kennicottii	G5/S2		Deciduous bottomlands and aspen stands
Eastern screech owl	Otus asio	G5/S3		Wooded river and stream bottoms, usually with cottonwoods
Northern pygmy-owl	Glaucidium gnoma	G5/S2	WGFD CWCS, WGFD NSS4	Coniferous forest
Burrowing owl Stagner Mtn*	**Athene cunicularia**	**G4/S3**	**WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS4**	**Plains and basins, often associated with prairie dog towns**
Great gray owl	Strix nebulosa	G5/S2	S-USFS R4, WGFD CWCS, WGFD NSS4	Coniferous forest with nearby open area
Calliope hummingbird	Stellula calliope	G5/S3		Meadows, parks, open woodlands, and willow and alder thickets, usually in montane conifer forest
Lewis' woodpecker	Melanerpes lewis	G4/S2	S-USFS R2, WGFD CWCS, WGFD NSS3	Open, mature ponderosa pine forest and recently burned forest
Williamson's sapsucker	Sphyrapicus thyroideus	G5/S2		Old-growth conifer forest, especially a mixture of spruce and lodgepole pine
American Three-toed Woodpecker	Picoides dorsalis	G5/S3	S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS4	Old-growth conifer forest, especially spruce-fir and ponderosa pine or recently burned forest
Loggerhead shrike	Lanius ludovicianus	G4/S3	WY BLM SSL, S-USFS R2	Open country with scattered trees and shrubs
Eastern phoebe	Sayornis phoebe	G5/SA		Wooded streams
Ash-throated flycatcher	Myiarchus cinerascens	G5/S3B	WGFD CWCS, WGFD NSS3	Juniper woodlands

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Juniper titmouse	Baeolophus ridgwayi	G5/S1	WGFD CWCS, WGFD NSS3	Juniper woodlands
Pygmy nuthatch Sheldon Dome*	**Sitta pygmaea**	**G5/S2**	**WGFD CWCS, WGFD NSS4**	**Mature ponderosa pine forest**
Canyon wren Stagner Mtn*	**Catherpes mexicanus**	**G5/S2S3**		**Rocky canyons and cliffs**
Winter wren Sheldon Dome*	**Troglodytes troglodytes**	**G5/SA**		**Brushy stream-sides in conifer forest**
American dipper Sheldon Dome*	**Cinclus mexicanus**	**G5/S4**		**Fast flowing rocky streams mostly in mountains, moves to lower elev. streams and rivers in winter**
Eastern bluebird	Sialia sialis	G5/S2		Open woodlands
Sage thrasher Sheldon Dome*	**Oreoscoptes montanus**	**G5/S5**	**WY BLM SSL, WGFD CWCS, WGFD NSS4**	**Tall sagebrush and greasewood**
Black-throated gray warbler Stagner Mtn	**Dendroica nigrescens**	**G5/S2**		**Juniper woodlands**
Townsend's warbler	Dendroica townsendi	G5/SA		Conifer forest, usually mature spruce-fir. Other pines during migration. Usually high in the trees.
Blue Grosbeak	Guiraca caerulea	G5/S3B		Thickets, stream sides, woodland edges
Dickcissel	Spiza americana	G5/S1	WGFD CWCS, WGFD NSS4	Tall grass
Sage sparrow	Amphispiza belli	G5/S3	WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS4	Medium to tall sagebrush shrubland
Baird's sparrow	Ammodramus bairdii	G4/S1B?/SZN	WY BLM SSL, WGFD NSS4	"Mid-grass" prairie and meadows?
Grasshopper sparrow	Ammodramus savannarum	G5/S4	S-USFS R2, WGFD CWCS, WGFD NSS4	
Clay-colored sparrow	Spizella pallida	G5/S3B		Brushy riparian areas and brushy woodland edges
Brewer's sparrow Sheldon Dome*	**Spizella breweri**	**G5/S5**	**WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS4**	**Sagebrush foothills and medium-height sagebrush in basins. Also, mountain mahogany hills.**
McCown's longspur	Calcarius mccownii	G5/S2	S-USFS R2, WGFD CWCS, WGFD NSS4	Sparsely vegetated shortgrass prairie
Chestnut-collared longspur	Calcarius ornatus	G5/S1	S-USFS R2, WGFD CWCS, WGFD NSS4	Medium height grass, especially meadows around ponds
Bobolink	Dolichonyx oryzivorus	G5/S2	WGFD CWCS, WGFD NSS4	Tall grass, usually with overlooking perch
Black-rosy finch Sheldon Dome*	**Leucosticte atrata**	**G4/S1B/S2N**	**WGFD CWCS, WGFD NSS4**	**Above timberline, usually near cliffs, rocky areas and snowfields. Can be found in open country and towns in the winter.**
White-winged crossbill	Loxia leucoptera	G5/S2		Conifer forest with an abundance of cones, especially mature spruce on high ridges

Sensitive MAMMALS Documented or Potentially in Request Area

Common Name	Scientific Name	Heritage Rank	Management Status	Habitat Notes
Dwarf shrew	Sorex nanus	G4/S4	WGFD CWCS, WGFD NSS3	Historically, found in alpine rubble slopes and conifer forests above 4,000 m. Sometimes found in prairie and pinyon-juniper at lower elevations.
Western small-footed myotis	Myotis ciliolabrum	G5/S3	WGFD CWCS, WGFD NSS3	Found in montane forests, sage steppes, and shortgrass prairie. Roosts: caves, mines

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Long-legged myotis Stagner Mtn*	**Myotis volans**	**G5/S3**	**WGFD CWCS, WGFD NSS2**	**Found in conifer and deciduous forests. Roosts include tree and rock crevices, snages and buildings.**
Long-eared myotis Stagner Mtn*	**Myotis evotis**	**G5/S4**	**WY BLM SSL, WGFD CWCS, WGFD NSS2**	**Found in conifer forests, especially ponderosa pine. Forage over water holes and possible openings in conifer forest. Roosts: caves, buildings, mines.**
Silver-haired bat	Lasionycteris noctivagans	G5/S3	WGFD CWCS, WGFD NSS4	Occur in a wide variety of habitats across Wyoming. Roosts: trees, caves, mines, houses.
Hoary bat Stagner Mtn*	**Lasiurus cinereus**	**G5/S4**	**WGFD CWCS, WGFD NSS4**	**Widespread and mobile, hoary bats are found in shrublands, grasslands, and aspen-pine forests near roosting habitat. Roosts: deciduous trees.**
Spotted bat	Euderma maculatum	G4/S3	WY BLM SSL, S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS2	Cliff roosting, generally near perennial water in a variety of habitats (including desert, shrub-steppe, and evergreen forest).
Townsend's big-eared bat Stagner Mtn	**Corynorhinus townsendii**	**G4/S2**	**WY BLM SSL, S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS2**	**Hibernates and day-roosts in caves and mines and will use buildings as day roosts. Typical habitat includes desert shrublands, pinyon-juniper woodlands, and dry conifer forests, generally near riparian or wetland areas.**
Uinta ground squirrel	Spermophilus armatus	G5/S3S4	WGFD CWCS, WGFD NSS6	Found in grasslands, sage, open areas in forests, and tundras. Usually occur at higher elevations than the Wyoming ground squirrel.
Wyoming pocket gopher Stagner Mtn*	**Thomomys clusius**	**G2/S2**	**WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS4**	**Dry upland areas (ridgetops, etc.) characterized by loose, gravel-like soil. Endemic to Wyoming, they are often observed near Bidger's Pass.**
Black-tailed prairie dog	Cynomys ludovicianus	G4/S2	USFWS ESA Listing Denied, S-USFS R2, WGFD CWCS, WGFD NSS3	Shortgrass prairie, usually with loose, sandy soils. Can form large, dense colonies.
White-tailed prairie dog	Cynomys leucurus	G4/S3	USFWS ESA Listing Denied, WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS4	Found in grassland and shrub-grass communities, often with loose, sandy soils. Colonies are usually not as large or dense as black-tailed prairie dog colonies.
Olive-backed pocket mouse	Perognathus fasciatus	G5/S4	WGFD CWCS, WGFD NSS3	Dry habitats ranging from gravelly soils to sandy areas of short grass prairies to sand dunes.
Gray wolf Sheldon Dome*	**Canis lupus**	**G4/S1**	**USFWS ESA Threatened (T, EXPN)**	**Formerly thought to be extinct in Wyoming, reintroduction in the Yellowstone area has lead to a viable population in that portion of the state. The gray wolf occupies a variety of habitats in that area, often associated with ungulate herds, such as elk.**
Fisher	Martes pennanti	G5/S1	S-USFS R4, WGFD CWCS, WGFD NSS3	Fishers are found in a variety of conifer forests, preferring mature stands with a dense overstory canopy.
Black-footed ferret Stagner Mtn	**Mustela nigripes**	**G1/S1**	**USFWS ESA Endangered (E, EXPN), WGFD CWCS, WGFD NSS1**	**Black-footed ferrets always occur in or near prairie dog colonies, generally on short or mixed-grass prairie.**
North American wolverine	Gulo gulo luscus	G4/S2	USFWS ESA Listing Denied, S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS3	Wolverine are rare and wide ranging, occurring mainly in the mountainous regions of western Wyoming. Given their large ranges, they can be found in a wide variety of habitats in these areas, particularly boreal conifer forests.

Bold = Documented in our Biotics database. * = Documented in buffer area only.

Sensitive HERPTILES Documented or Potentially in Request Area				
Common Name	**Scientific Name**	**Heritage Rank**	**Management Status**	**Habitat Notes**
Tiger salamander Stagner Mtn*	**Ambystoma tigrinum**	**G5/S4**	**WGFD CWCS, WGFD NSS4**	**Tiger salamanders can be found in fairly moist environments ranging from rodent burrows to window wells to burrows in sand dunes. Larvae found in intermittent streams, ponds, and lakes.**
Boreal western toad (Northern Rocky Mountain population)	Bufo boreas boreas	G4/T4/S1	WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS1	Boreal toads can be found in and near permanent (or semi-permanent) montane wetlands that have shallow areas for breeding and egg laying (strictly above 8,000 feet).
Northern leopard frog Sheldon Dome* Stagner Mtn*	**Rana pipiens**	**G5/S3**	**WY BLM SSL, S-USFS R2, WGFD CWCS, WGFD NSS4**	**Found near permanent water in areas up to about 9,000 feet. Lower elevation sites are usually swampy cattail marshes and higher ones tend to be beaver ponds.**
Columbia spotted frog (Statewide)	Rana luteiventris	G4/S3	WY BLM SSL, S-USFS R2, S-USFS R4, WGFD CWCS, WGFD NSS4	Spotted frogs can be found in ponds, wetlands, and small streams from mountain foothills to high elevation conifer forest, particularly where these water bodies are permanent.
Spiny softshell turtle	Trionyx spiniferus	G5/S4		The spiny softshell turtle prefers permanent lakes and larger streams at elevations below 6000 feet.
Milk snake	Lampropeltis triangulum	G5/S3	WGFD CWCS, WGFD NSS2	Milk snakes can be found in woodlands along escarpments in prairie communities below about 6,000 feet.
Eastern yellowbelly racer Stagner Mtn	**Coluber constrictor flaviventris**	**G5/T5/S4**	**WGFD CWCS, WGFD NSS4**	**The eastern yellow belly racer is found in woodland communities in the plains and foothills zones, usually in the vicinity of water.**

Appendix B – USFWS Endangered Species List for Freemont and Hot Springs Counties, Wyoming.

U.S. Fish & Wildlife Service
Mountain-Prairie Region

Endangered Species

WYOMING

Federally listed and proposed (P), endangered (E), threatened (T), experimental (X), and candidate (C) species and habitat in Wyoming by county updated December 2006

For additional information contact: U.S. Fish and Wildlife Service, Wyoming Field Office, 5353 Yellowstone Road, Cheyenne, Wyoming 82003, telephone 307-772-2374.

SYMBOLS:
* Water depletions in the Colorado River Yampa River, and Green River may affect the species and/or critical habitat in downstream reaches in other states.
▲ Water depletions in the South Platte River may affect the species and/or critical habitat in downstream reaches in other states.
© There is designated critical habitat for the species within the county.

Species	Scientific Name	Status
ALBANY		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Eskimo Curlew ▲	Numenius borealis	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Preble's Meadow Jumping Mouse ©	*Zapus hudsonius preblei*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
Wyoming Toad	*Bufo baxteri*	E
BIG HORN		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Gray Wolf	*Canis lupus*	X
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
CAMPBELL		
Bald Eagle	*Haliaeetus leucocephalus*	T

Black-footed Ferret	*Mustela nigripes*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
CARBON		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Blowout Penstemon	*Penstemon haydenii*	E
Bonytail *	*Gila elegans*	E
Canada Lynx	*Lynx canadensis*	T
Colorado Pikeminnow *	*Ptychocheilus lucius*	E
Eskimo Curlew ▲	Numenius borealis	E
Humpback Chub *	*Gila cypha*	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Razorback Sucker *	*Xyrauchen texanus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
CONVERSE		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Eskimo Curlew ▲	Numenius borealis	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Preble's Meadow Jumping Mouse ©	*Zapus hudsonius preblei*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
CROOK		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
FREMONT		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T

Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Desert Yellowhead ©	*Yermo xanthocephalus*	P
Eskimo Curlew ▲	Numenius borealis	E
Gray Wolf	*Canis lupus*	X
Grizzly Bear	*Ursus arctos horribilis*	T
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
GOSHEN		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Colorado Butterfly Plant	*Gaura neomexicana ssp. coloradensis*	T
Eskimo Curlew ▲	Numenius borealis	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Preble's Meadow Jumping Mouse	*Zapus hudsonius preblei*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
HOT SPRINGS		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Gray Wolf	*Canis lupus*	X
Grizzly Bear	*Ursus arctos horribilis*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
JOHNSON		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T

LARAMIE		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Gray Wolf	*Canis lupus*	T
Colorado Butterfly Plant ©	*Gaura neomexicana ssp. coloradensis*	T
Eskimo Curlew ▲	Numenius borealis	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Preble's Meadow Jumping Mouse ©	*Zapus hudsonius preblei*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
LINCOLN		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Bonytail *	*Gila elegans*	E
Canada Lynx	*Lynx canadensis*	T
Colorado Pikeminnow *	*Ptychocheilus lucius*	E
Gray Wolf	*Canis lupus*	X
Grizzly Bear	*Ursus arctos horribilis*	T
Humpback Chub *	*Gila cypha*	E
Razorback Sucker *	*Xyrauchen texanus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
NATRONA		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Eskimo Curlew ▲	Numenius borealis	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
NIOBRARA		

Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Eskimo Curlew ▲	Numenius borealis	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
PARK		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Gray Wolf	*Canis lupus*	X
Grizzly Bear	*Ursus arctos horribilis*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
PLATTE		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Eskimo Curlew ▲	Numenius borealis	E
Interior Least Tern ▲	*Sternula antillarum*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Preble's Meadow Jumping Mouse ©	*Zapus hudsonius preblei*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
SHERIDAN		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
SUBLETTE		
Bald Eagle ▲	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E

Bonytail *	*Gila elegans*	E
Canada Lynx	*Lynx canadensis*	T
Colorado Pikeminnow *	*Ptychocheilus lucius*	E
Eskimo Curlew ▲	Numenius borealis	E
Gray Wolf	*Canis lupus*	X
Grizzly Bear	*Ursus arctos horribilis*	T
Humpback Chub *	*Gila cypha*	E
Interior Least Tern ▲	*Sternula antillarum*	E
Kendall Warm Springs Dace	*Rhinichthys osculus thermalis*	E
Pallid Sturgeon ▲	*Scaphirhynchus albus*	E
Piping Plover ▲	*Charadrius melodus*	T
Razorback Sucker *	*Xyrauchen texanus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Western Prairie Fringed Orchid ▲	*Platanthera praeclara*	T
Whooping Crane ▲	*Grus americana*	E
SWEETWATER		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Bonytail *	*Gila elegans*	E
Colorado Pikeminnow *	*Ptychocheilus lucius*	E
Humpback Chub *	*Gila cypha*	E
Razorback Sucker *	*Xyrauchen texanus*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
TETON		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Gray Wolf	*Canis lupus*	X
Grizzly Bear	*Ursus arctos horribilis*	T
UINTA		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Bonytail *	*Gila elegans*	E
Colorado Pikeminnow *	*Ptychocheilus lucius*	E
Humpback Chub *	*Gila cypha*	E
Razorback Sucker *	*Xyrauchen texanus*	E

Ute Ladies'-tresses	*Spiranthes diluvialis*	T
WASHAKIE		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Canada Lynx	*Lynx canadensis*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
WESTON		
Bald Eagle	*Haliaeetus leucocephalus*	T
Black-footed Ferret	*Mustela nigripes*	E
Ute Ladies'-tresses	*Spiranthes diluvialis*	T

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Appendix C – USFWS PII Scores

Appendix C – USFWS PII Scores

POTENTIAL IMPACT INDEX CHECKLISTS

PHYSICAL ATTRIBUTE CHECKLIST

Physical Attribute				Site: Sheldon Dome	Foote Creek Rim	Hutton Lake NWF	Stagner Mountain
Topography	Mountain Aspect*	Side	W	X	X	X	
			E	X	X	X	
			N			X	X
			S			X	X
		Top					
		Foothill	W				
			E				
			N				
			S				
	Valley*					X	
	Pass*						
	Gap*						
	Ridge*			X	X		X
	Bluff*						
	Butte*						
Wind* Direction	S			X	X	X	X
	N						
	E						
	W			X	X	X	X
	Updrafts*			X	X	X	X
Migratory* Corridor Potential	Latitudinal (N ↔ S)					X	X
	Longitudinal (E ↔ W)						
	Wide Approaches (>30 km)*					X	X
	Funnel Effect*	Horizontal					X
		Vertical					
Site Size (acres) & Configuration*	<640			X	X	X	X
	>640 <1000			X	X	X	X
	>1000 <1500			X	X	X	X
	Turbine Rows not Parallel to Migration			X	X	X	X
Infrastructure To Build	Transmission			X	X	X	X
	Roads			X	X	X	X
	Buildings*		Storage	X	X	X	X
			Maintenance	X	X	X	X
			Daily Activity	X	X	X	X
	Substation			X	X	X	X
Increased Activity*				X	X	X	X
			Totals	17	16	21	20

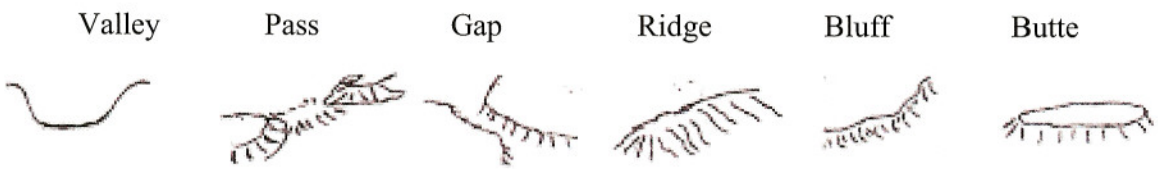
PHYSICAL ATTRIBUTE CHECKLIST

Physical Attribute				Site: Sheldon Dome	Foote Creek Rim	Hutton Lake NWF	Stagner Mountain
Topography	Mountain Aspect*	Side	W	X	X	X	
			E	X	X	X	
			N			X	X
			S			X	X
		Top					
		Foothill	W				
			E				
			N				
			S				
	Valley*					X	
	Pass*						
	Gap*						
	Ridge*			X	X		X
	Bluff*						
	Butte*						
Wind* Direction	S			X	X	X	X
	N						
	E						
	W			X	X	X	X
	Updrafts*			X	X	X	X
Migratory* Corridor Potential	Latitudinal (N ↔ S)					X	X
	Longitudinal (E ↔ W)						
	Wide Approaches (>30 km)*					X	X
	Funnel Effect*	Horizontal					X
		Vertical					
Site Size (acres) & Configuration*	<640			X	X	X	X
	>640 <1000			X	X	X	X
	>1000 <1500			X	X	X	X
	Turbine Rows not Parallel to Migration			X	X	X	X
Infrastructure To Build	Transmission			X	X	X	X
	Roads			X	X	X	X
	Buildings*		Storage	X	X	X	X
			Maintenance	X	X	X	X
			Daily Activity	X	X	X	X
	Substation			X	X	X	X
Increased Activity*				X	X	X	X
			Totals	17	16	21	20

PHYSICAL ATTRIBUTE CRITERIA - 36 categories, max $\sum = 36$, ($p = 0.25$).

Topography - Terrain characteristic within the ecological influence of the proposed wind farm, generally, but not restricted to ± 8 km.

Mountain Aspect - Aspect of topography for site of proposed development. Multiple categories may be checked.



Wind Direction - Compass direction *from* which prevailing winds approach. Multiple categories may be checked.

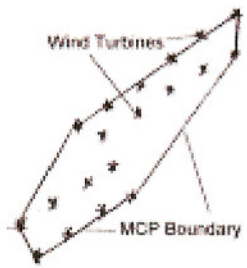
Updrafts - Do updrafts/upslope winds prevail?

Migratory Corridor Potential - Subjective estimate of area to be a potential avian/bat migratory corridor based strictly on topographical characteristics. Multiple categories may be checked.

Wide (>30 km) - Terrain characteristics of approaches to site from each migratory direction, i.e., a large plain, river corridor, long valley. The larger the area that migrant birds/bats are drawn from, the more may be at risk

Funnel Effect - Is the site in or near an area where migrant birds/bats may be funneled (concentrated) into a smaller area, either altitudinally, laterally, or both?

Site Size & Configuration – Size is estimated as if a minimum convex polygon (MCP) were drawn around peripheral turbines.



Successive boxes are checked to convey relationship of larger size = increased impact to birds/bats, *e.g.*, a 700 acre site will have 2 categories checked while a 1200 acre site will have all 3 categories checked.

Configuration of turbine rows is usually perpendicular to prevailing wind direction. Rows aligned perpendicular or oblique to route of migration intuitively presents more risk to birds than rows aligned parallel to movement.

Buildings – Building are categorized by relative size and visitation frequency, *i.e.,* structures that are visited daily are usually larger and present more impact than those that are not. If a "Daily Activity" building is required, all Building categories are checked. If a maintenance structure is required, Storage is also checked.

Increased Activity - Will any type of human activity increase? Sites in urban-suburban or otherwise developed areas (oil, gas, mines) will have less impact on vertebrate wildlife than those in remote or undeveloped areas.

Avian Species of Special Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS CHECKLIST)

	Site											
Birds (n = 28)	Sheldon Dome			Foote Creek Rim			Hutton NWF			Stagner Mountain		
Occurrence[1]	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**
Swainson's Hawk	X	X	2	X	X	2	X	X	2	X	X	2
Ferruginous Hawk	X	X	2	X	X	2	X	X	2	X	X	2
Golden Eagle	X	X	2	X	X	2	X	X	2	X	X	2
Peregrine Falcon								X	1	X	X	2
Prairie Falcon	X	X	2	X	X	2				X	X	2
Yellow Rail												
American Golden-Plover								X	1		X	1
Snowy Plover											X	1
Mountain Plover	X		1	X		1						
Solitary Sandpiper								X	1		X	1
Upland Sandpiper								X	1		X	1
Whimbrel								X	1		X	1
Long-billed Curlew								X	1		X	1
Marbled Godwit								X	1		X	1
Sanderling								X	1		X	1
Wilson's Phalarope							X	X	2		X	1
Yellow-billed Cuckoo											X	1
Flammulated Owl												
Black Swift												
Lewis's Woodpecker											X	1
Williamson's Sapsucker										X	X	2
Red-naped Sapsucker										X	X	2
White-headed Woodpecker												
Loggerhead Shrike	X	X	2	X	X	2	X	X	2	X	X	2
Pygmy Nuthatch											X	1
Virginia's Warbler												
Brewer's Sparrow	X	X	2	X	X	2	X	X	2		X	1
McCown's Longspur				X	X	2	X	X	2			
Subtotals	7	6	13	8	7	15	7	15	22	8	21	29
Total			13			15			22			29

Avian Species of Special Concern Checklist (28 species, max $\sum = 56$)

Column totals of this list are added to appropriate cells in the SPECIES OCCURRENCE & STATUS CHECKLIST. The species in this list are the birds of conservation concern for BCR 10 – Northern Rockies. Species occurrence was based on habitat, range maps available from (Cerovski et al. 2004), Johnson et al. 2000, and personal experience with each area.

In addition to species lists (rows), season of occurrence is also indicated (columns). "B" indicates breeding or summer occurrence and "M/W" indicates presence during migration or as wintering species. If occurrence within or in the vicinity ($\leq$ 7 km) of a proposed site is confirmed or suspected, an "X" is entered.

Bat Species Of Special Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS CHECKLIST)

	Site											
Bats (n = 5)	Sheldon Dome			Foote Creek Rim			Hutton NWF			Stagner Mountain		
Occurrence	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**
Myotis, Long-eared										X	X	2
Myotis, Fringed												
Bat, Townsend's Big-eared										X	X	2
Subtotals												
Total			0			0			0			4

Bat Species Of Special Concern Checklist (3 species, max $\sum = 6$).

Column totals of this list are added to appropriate cells in the SPECIES OCCURRENCE & STATUS CHECKLIST. Bats listed in this table are listed by the Rawlins BLM as sensitive. Species occurrence was based upon available data from WYNDD, WGFD WOS, Gruver 2002, and Clark and Stromberg 1987.

In addition to species lists (rows), season of occurrence is also indicated (columns). "B" indicates breeding or summer occurrence and "M/W" indicates presence during migration or as wintering species. If occurrence within or in the vicinity ($\leq$ 7 km) of a proposed site is confirmed or suspected, an "X" is entered.

SPECIES OCCURRENCE & STATUS CHECKLIST

Species		Site											
		Sheldon Dome			Foote Creek Rim			Hutton NWF			Stagner Mountain		
	Occurrence	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**
Threatened & Endangered	Bald Eagle		X	1	X	X	2		X	1	X	X	2
	Wyoming Toad							X	X	2			
	Ute ladies'-tresses orchid												
	Colorado Butterfly Plant												
	Grizzly Bear												
	Gray Wolf												
	Black-footed Ferret												
	Blow-out Penestemon												
	Desert Yellowhead												
Candidate*	Canada Lynx												
Special Concern*	Birds (max ∑=58)	7	6	13	8	7	15	7	15	22	8	21	29
	Bats (max ∑=6)	0	0	0	0	0	0	0	0	0	2	2	4
Golden Eagle*		X	X	2	X	X	2	X	X	2	X	X	2
Sage Grouse*		X	X	2	X	X	2				X	X	2
Bats*		X	X	2	X	X	2	X	X	2	X	X	2
	Subtotals	10	10	20	12	11	23	10	19	29	14	27	41
	Total			20			23			29			41

SPECIES OCCURRENCE & STATUS CHECKLIST (15 categories, max $\sum = 90$)

Checklist totals for each column in "Avian Species of Special Concern List" and "Bat Species of Special Concern List are inserted in this checklist.

Threatened & Endangered Species - Species include in the Federal List of Endangered and Threatened Species for Wyoming.

Candidate Species - Species being investigated for inclusion in the Federal List of Endangered and Threatened Species for Wyoming.

Species of Special Concern – This list is comprised of the Birds of Conservation Concern for the Northern Rockies Bird Conservation Region.

Golden eagles are included in this checklist because of special protective status afforded under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Sage grouse are included because of recent (*ca.* Y2K) concern over population declines range wide (citation). Bats (other than bat Species of Special Concern) are included due to generally unknown impacts of wind farms on individual and populations.

ECOLOGICAL ATTRACTIVENESS CHECKLIST

Ecological Attractor			Site: Sheldon Dome	Site: Foote Creek Rim	Site: Hutton NWF	Site: Stagner Mountain
Migration Route*	Local				X	X
	Continental*	N	X	X	X	X
		S	X	X	X	X
		E				
		W				
Ecological Magnets*	Lotic System					
	Lentic System				X	
	Wetlands				X	
	Native Grassland		X	X	X	X
	Forest					X
	Food Concentrated			X	X	X
	Energetic Foraging					
	Vegetation/ Habitat	Unique				
		Diverse				
Significant Ecological Event*						
Site of Special Conservation Status*					X	
Total			3	4	9	6

ECOLOGICAL ATTRACTIVENESS CHECKLIST

Ecological Attractor			Site: Sheldon Dome	Site: Foote Creek Rim	Site: Hutton NWF	Site: Stagner Mountain
Migration Route*		Local			X	X
	Continental*	N	X	X	X	X
		S	X	X	X	X
		E				
		W				
Ecological Magnets*		Lotic System				
		Lentic System			X	
		Wetlands			X	
		Native Grassland	X	X	X	X
		Forest				X
		Food Concentrated		X	X	X
		Energetic Foraging				
	Vegetation/ Habitat	Unique				
		Diverse				
Significant Ecological Event*						
Site of Special Conservation Status*					X	
		Total	3	4	9	6

ECOLOGICAL ATTRACTIVENESS CRITERIA - 16 categories, max$\sum$ = 17

Migration Route - Indicates predominate direction of movement of seasonal migrations. Multiple categories may be checked.

Local - Some avian populations move only altitudinally & direction may be East-West (sage grouse, owls, bald eagles).

Continental - Some migratory corridors experience mass movements in only one season/direction annually (*e.g.*, Bridger Mountains autumn eagle migration).

Ecological Magnets - Special, unique, unusual, or super ordinary habitats or conditions within the vicinity of the site that may attract vertebrate wildlife. Lotic systems include small perennial or seasonal creeks to major rivers. Lentic systems include stock ponds to lakes. Multiple categories may be checked.

Vegetation/Habitat - Unique or exceptionally diverse vegetation or habitat in the vicinity may indicate exceptional diversity and abundance of avian species or bats.

Significant Ecological Event - Special, unique, unusual, or super ordinary events that occur or are suspected to occur in the vicinity of the site, *e.g.*, up to one third of the Continental population of Trumpeter Swans visit Ennis Lake, < 4 km from a proposed Wind Resource Area; the Continental migration of shorebirds passes over (many stop) @ Benton Lake National Wildlife Refuge) and up to 2000 golden eagles pass over the Bridger Mountains in autumn. If unknown but suspected a "?" is entered. Specifics regarding the cell are then addressed in the appropriate box of the SITE SPECIFIC COMMENTS sheet to focus follow-up investigation and assist in definition of study objectives.

Site of Special Conservation Status - Any existing or proposed covenants, conservation easements, or other land development limitations intended to conserve, protect, or enhance wildlife or habitat. This criterion is weighted (2 entered if true) because of previous financial or other investment in ecological values. Specifics regarding the easement are then addressed in the appropriate box of the SITE SPECIFIC COMMENTS sheet to focus follow-up attention.

POTENTIAL IMPACT INDEX

	Site							
	Sheldon Dome		Foote Creek Rim		Hutton NWF		Stagner Mountain	
Checklist (p)[1]	Σ	Σ/p	Σ	Σ/p	Σ	Σ/p	Σ	Σ/p
Physical (36 checks = 36/143 = 0.25)	17	68	16	64	21	84	20	80
Species Occurrence & Status (0.63)	23	37	23	36	29	46	41	65
Ecological (0.12)	3	25	4	33	9	75	6	50
Totals		130		133		205		195

[1]Proportion of total (143) checklist scores.

SITE SPECIFIC COMMENTS

Checklist	Site: Sheldon Dome	Site: Foote Creek Rim	Site: Hutton NWF	Site: Stagner Mountain
Physical	One northwest – southeast running ridge	Long-running north-south rim perpendicular to the wind	Relatively flat wetland complex in the Laramie Valley	East – West running ridge above Wind River
Species Occurrence	Species expected are typical of sagebrush and grassland habitats	Species present are typical of grassland and sagebrush habitats	Many shorebirds stop here during migration	A mix of species present in sagebrush and grasslands
			Other waterbirds breed here.	Due to presence of forests, other species present
				Presence of Wind River increases species migrating here
Ecological	Area lacks water and wetlands	Prairie Dog colonies present	Wetlands and prairie dogs are present	Prairie Dog colonies present
		Area lacks water and wetlands	This site is a National Wildlife Refuge	Forests present on side of ridge

Eastern Shoshone Tribe and Northern Arapahoe
on the Wind River Indian Reservation

Renewable Energy Development on Tribal Lands
DE-PS36-04GO94003

Appendix 3

2012 WIND RIVER BASIN GENERATION ADDITION STUDY

Prepared by
Excel Engineering, Inc.

For
Disgen Development Services LLC

Principal Contributor:
John Wetzel

June 8, 2009

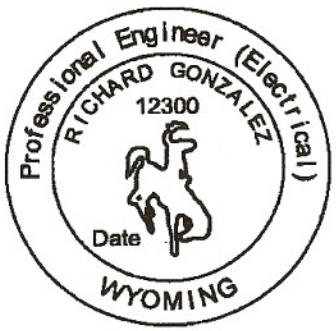
I hereby certify this plan, specification, or report was prepared by me or under my direct supervision in accordance with applicable standards of practice, and that I am a duly Licensed Professional Engineer under the Laws of the State of Colorado.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the Laws of the State of Wyoming.

The information in this document is based upon the knowledge and information available at the time it was prepared. This certification is not a guaranty or warranty, expressed or implied.

Richard Gonzalez
Registration Number 41395
June 8, 2009

Richard Gonzalez
Registration Number 12300
June 8, 2009



PURPOSE

The purpose of this study is to determine if specific maximum amounts of new generation can be added at three locations on the existing electric transmission system in the Wind River Basin of Wyoming. The proposed generation amounts and locations are:

1. 30 MW at the Burris 69 kV substation
2. 90 MW at the Boysen 115 kV substation
3. 200MW at a new substation located between Thermopolis and Riverton on the existing Thermopolis – Riverton 230 kV line.

The analysis was performed as a screening-level analysis, considering only transmission and generation facilities as represented in the selected WECC power system model. This is an "out-of-queue-order" evaluation; no existing near-by queued generation interconnection requests (if any exist) were taken into consideration.

RESULTS

The results of this study show:

1. Up to 23 MW of new generation can be added near Burris
2. 90 MW of generation can be added at the Boysen substation
3. 200 MW of new generation can be added on the existing Thermopolis – Riverton 230 kV line.

None of these proposed additions would require any additional power system improvements beyond those directly associated with the proposed generation interconnection to the existing transmission facilities.

PROCEDURE

This study uses a 2012 WECC base case with the Wind River Basin adjusted with local hydroelectric generation maximized to represent Heavy Spring conditions. Figure 1 is a map of the Wind River basin showing the approximate locations of the proposed new generation sites.

CRITERIA

For system intact conditions, bus voltages between 0.95 and 1.05 per unit (95% to 105% of nominal bus voltage) were considered acceptable. Transmission line and transformer loadings less than 100% of maximum seasonal ratings were acceptable.

For single contingency (N-1) outage conditions, bus voltages between 0.90 and 1.10 per unit were considered acceptable. Transmission line loadings less than 100% of thermal rating and transformer loadings of less that 100% of maximum rating were considered acceptable.

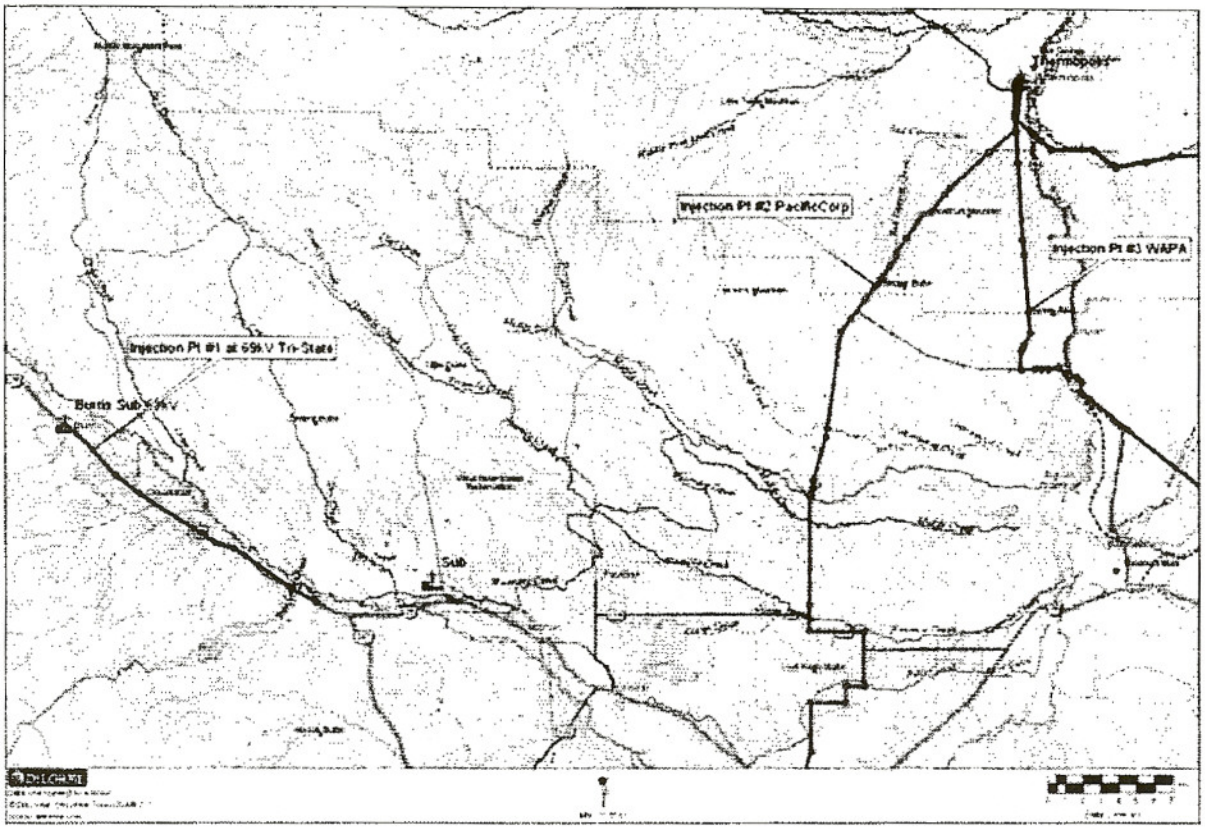


Figure 1: Wind River Basin proposed generation locations

A series of single contingency outages, consisting of all non-radial lines and transformers in the Wind River Basin with operating voltages 69 kV and higher, was tested against each new case that was developed. System Criteria violations for each scenario were captured.

For each proposed site, several levels of generation were tested, from 0 MW up to the maximum proposed generation level at each site. These levels of generation were tested to determine if new system criteria violations would occur at levels less than the proposed maximum level. These three sites were tested independently; no "simultaneous" scenarios were examined.

SITE 1: BURRIS 69 kV

The existing Burris 69 kV substation is located on a radial 69 kV line owned by Tri-State G&T and connected to the 115 kV system through two 115/69 kV transformers at WAPA's Pilot Butte substation. Since the radial line is not included in the existing WECC models, the proposed new generation was modeled at the Pilot Butte 69 kV bus. 2 MW of existing hydroelectric generation are also located on the Pilot Butte 69 kV bus.

Table 1 shows the criteria violations that presently exist on the local system plus one new violation that will occur when the total generation on the Pilot Butte 69 kV bus is equal to or greater than 25 MW; since the total existing generation is 2 MW, no more than 23 MW of new generation can be added. The outage of one of the existing Pilot Butte transformers (transformer #2) overloads the remaining transformer when more than 25 MW of generation is injected into the Pilot Butte 69 kV bus. The column for Case A has no new generation added, so the criteria violations shown are existing problems. Per cent loadings are shown in the table.

Two sets of generation schedules were studied: new generation was scheduled to the North by offsetting generation at Yellowtail, and generation was scheduled to the south by offsetting generation at Jim Bridger.

Figure 2 shows the worst case outage condition at the Pilot Butte 69 kV bus with 25 MW on the 69 kV bus (2 MW of existing hydroelectric and 23 MW of new Burris generation).

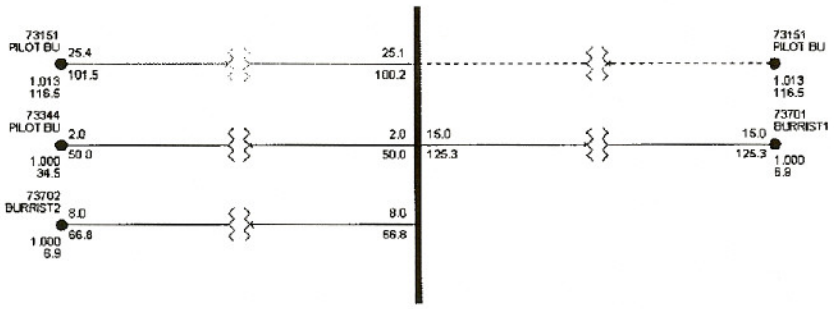


Figure 2: Pilot Butte 69 kV bus, 25 MW of generation, outage of transformer #2
[upper # = MW loading, lower # = % of line or transformer rating]

There were no other system problems due to the addition of generation near Pilot Butte.

Table 1: New Generation at Burris
(Pilot Butte 69 kV

		Burris Generation North	0 MW	15 MW	23 MW	30 MW			
		Burris Generation south	0 MW				15 MW	23 MW	30 MW
Case definition	criteria	monitored element	Case a	Case b	Case c	Case d	Case e	Case f	Case g
OUTAGE: YELOWTLP230. YELLOW 230.0 1	high-flow > 98	BASIN___115.-NAHNEJEN115.	99.91	ok	ok	ok	99.12	98.70	98.33
OUTAGE: YELOWTLP230. YELLOW 230.0 1	high-flow > 98	LOVELL__115.-NAHNEJEN115.	114.15	110.49	108.55	106.85	113.33	112.90	112.52
OUTAGE: CASPERPP115. CASPER 69.0 1	high-flow > 100	CASPERPP115.-CASPERPP69.0	139.98	139.94	139.92	139.90	139.96	139.95	139.95
OUTAGE: CASPERPP115. CASPER 69.0 2	high-flow > 100	CASPERPP115.-CASPERPP69.0	138.75	138.71	138.69	138.68	138.73	138.72	138.72
OUTAGE: MIDWEST230. MIDWES 69.001	high-flow > 100	MIDWEST_230.-MIDWEST_69.0	140.53	140.41	140.35	140.30	140.49	140.47	140.45
OUTAGE: MIDWEST230. MIDWES 69.002	high-flow > 100	MIDWEST_230.-MIDWEST_69.0	102.25	102.17	102.13	102.09	102.22	102.20	102.19
OUTAGE: PILOT BU115. PILOT 69.0 2	high-flow > 100	PILOT BU115.-PILOT BU69.0 1	ok	ok	100.20	128.04	ok	100.16	128.02

Table 2: New Generation at Boysen

		Boysen Generation North	0 MW	30 MW	60 MW	90 MW			
		Boysen Generation south	0 MW				30 MW	60 MW	90 MW
BOYSEN.sav case definition	criteria	monitored element	Case Ba	Case Bb	Case B c	Case Bd	Case Be	Case Bf	Case Bg
OUTAGE: YELOWTLP230. YELLOW 230.0 1	high-flow > 98	BASIN___115.-NAHNEJEN115.	100.17	ok	ok	ok	98.35	ok	ok
OUTAGE: YELOWTLP230. YELLOW 230.0 1	high-flow > 98	LOVELL__115.-NAHNEJEN115.	114.29	106.63	98.87	ok	112.34	110.28	108.23
OUTAGE: CASPERPP115. CASPER 69.0 1	high-flow > 100	CASPERPP115.-CASPERPP69.0	139.95	139.91	139.89	139.88	139.95	139.96	139.99
OUTAGE: CASPERPP115. CASPER 69.0 2	high-flow > 100	CASPERPP115.-CASPERPP69.0	138.72	138.68	138.66	138.65	138.72	138.73	138.76
OUTAGE: MIDWEST230. MIDWES 69.0 1	high-flow > 100	MIDWEST_230.-MIDWEST_69.0 2	140.49	140.30	140.14	140.02	140.45	140.43	140.42
OUTAGE: MIDWEST230. MIDWES 69.0 2	high-flow > 100	MIDWEST_230.-MIDWEST_69.0 1	102.22	102.10	101.99	101.90	102.19	102.18	102.17

Table 3: New Generation on Thermopolis - Riverton 230 kV line

		Generation Scheduled North	0 MW	100 MW	150 MW	200 MW			
		Generation Scheduled south	0 MW				100 MW	150 MW	200 MW
NEWDIS case definition	criteria	monitored element	Case Ta	Case Tb	Case Tc	Case Td	Case Te	Case Tf	Case Tg
OUTAGE: YELOWTLP230. YELLOW 230.0 1	high-flow > 98	BASIN___115.-NAHNEJEN115.	104.48	ok	ok	ok	100.34	98.19	ok
OUTAGE: YELOWTLP230. YELLOW 230.0 1	high-flow > 98	LOVELL__115.-NAHNEJEN115.	118.57	ok	ok	ok	114.18	111.95	109.69
OUTAGE: CASPERPP115. CASPER 69.001	high-flow > 100	CASPERPP115.-CASPERPP69.0	139.77	139.47	139.53	139.47	139.63	139.61	139.62
OUTAGE: CASPERPP115. CASPER 69.002	high-flow > 100	CASPERPP115.-CASPERPP69.0	138.55	138.26	138.31	138.26	138.41	138.39	138.40
OUTAGE: MIDWEST230. MIDWES 69.001	high-flow > 100	MIDWEST_230.-MIDWEST_69.0	140.31	139.53	139.47	139.23	140.03	139.96	139.93
OUTAGE: MIDWEST230. MIDWES 69.002	high-flow > 100	MIDWEST_230.-MIDWEST_69.0	102.10	101.58	101.55	101.40	101.92	101.87	101.85

SITE 2 - BOYSEN 115 kV

The existing Boysen – Thermopolis 115 kV line runs through a canyon starting just north of the Boysen substation. Placing a new substation in this canyon would be extremely difficult and expensive, so the new generation was modeled at the Boysen 115 kV bus.

Table 2 shows all criteria violations in the Wind River Basin for existing conditions (no new generation, Case Ba) and with incremental amounts of generation added at Boysen and scheduled to the North and the South. There are no new criteria violations due to the addition of generation up to the 90 MW level of interest at the Boysen 115 kV bus, and the existing overloads are reduced slightly by the new generation.

In all cases, the existing Boysen hydroelectric generation is maximized to represent Heavy Spring runoff conditions.

SITE 3 – NEW TAP ON THE THERMOPOLIS – RIVERTON 230 kV LINE

A new injection point was modeled on Pacificorp's existing Thermopolis – Riverton 230 kV line, and incremental amounts of new generation (100 MW, 150 MW and 200 MW) were modeled at the new point with power scheduled to both the North and the South.

Table 3 shows all criteria violations in the Wind River Basin. Existing violations are shown in the column under Case Ta, where there was no new generation on the Thermopolis – Riverton 230 kV line. The other cases show a slight improvement in the overloads as generation is increased.

There are no new loading or voltage problems due to the addition of generation on the Thermopolis – Riverton 230 kV line.

CONCLUSIONS

In the 2012 time frame, up to 23 MW of new generation can be added at the Pilot Butte 69 kV bus, 90 MW of generation can be added to the Boysen 115 kV bus, and 200 MW can be added at a new substation on the Thermopolis – Riverton 230 kV line. These conclusions are based on the power system modeling performed, simulating the Year 2012 Heavy Spring conditions considered most relevant to this type of screening-level analysis. Evaluation of other scenarios, such as future year conditions, different regional generation patterns, or consideration of any queued generation additions not represented in the model could result in significantly different results.

See Appendices A, B, and C for lists of single contingency outages, monitored buses and monitored transmission elements.

ADDITIONAL CONSIDERATIONS

This study investigates the amount of generation that can be added at points in the Wind river Basin. Actual transmission costs associated with delivery of power to specific customers may vary. For example, if new generation is located on Tri-State's 69 kV line near Burris, delivery to a customer other than Tri-State or WAPA may require transmission arrangements with both Tri-State and WAPA, which may add significant costs to the customer.

Also, on the electrical system near the Wind River Basin, there are three constricted transmission paths which may be affected by new generation, depending on how power is scheduled. Some of these schedules may be beneficial in reducing path flows.

Table 4 shows some typical changes in flows on the "TOT4A", "TOT4B" and "Yellowtail South" Paths that are dependent on schedules from the new proposed sites. These are presented only as typical possible flow changes, as other generation in the Wind River Basin can also influence the flows on these paths.

Table 4: Path Flow Changes

LOCATION	GENERATION	SCHEDULE	MVA CHANGE	MVA CHANGE	MVA CHANGE
			TOT 4A	TOT 4B	YT SOUTH
BURRIS	23	NORTH	-5.7	2.1	10.6
BURRIS	23	SOUTH	-12.8	8.8	2.4
BOYSEN	90	NORTH	-18.3	41.4	42.9
BOYSEN	90	SOUTH	-46.5	82.1	10.5
TH-RIVERTON	200	NORTH	-52.4	15.7	82.9
TH-RIVERTON	200	SOUTH	-116.2	53.5	14.5

From this table it is seen that the modeled power deliveries reduce loading on the TOT4A path, and increase loadings on the TOT4B and Yellowtail South paths. Whether the observed increases are problematic or not depends on the degree of loading on these interfaces caused by other transmission system usages, and their scheduling priorities (firm vs. non-firm).

Appendix A: Single Contingency Outages

1. ALCOVA 115.0 RADERVIL 115.0 1
2. ANT MINE 230.0 TEKLA 230.0 1
3. ANT MINE 230.0 YELLOWCK 230.0 1
4. BADWATER 230.0 SPENCE 230.0 1
5. BADWATER 230.0 THERMOPL 230.0 1
6. BASIN 115.0 NAHNEJEN 115.0 1
7. BASIN 115.0 WORLANTP 115.0 1
8. BGEORGE 115.0 LOVELL 115.0 1
9. BGEORGE 115.0 MEETSETP 115.0 1
10. BGEORGE 69.0 BGEORGE 115.0 1
11. BGEORGE 69.0 GLENDLTP 69.0 1
12. BLGS PHA 230.0 YELOWTLP 230.0 1
13. BOYSEN 115.0 COPPERMT 115.0 1
14. BOYSEN 115.0 HARRSBRG 115.0 1
15. BOYSEN 115.0 THERMOPL 115.0 1
16. BUFBASIN 69.0 CMTDUM 69.0 1
17. BUFFALO 230.0 CARR DRA 230.0 1
18. BUFFALO 230.0 KAYCEE 230.0 1
19. BUFFALO 230.0 SHERIDAN 230.0 1
20. BUFFBILL 69.0 BUFFBLPP 69.0 1
21. BUFFBILL 69.0 HEART MT 69.0 1
22. BUFFBILL 69.0 N. CODY 69.0 1
23. CARR DRA 230.0 BARBERCK 230.0 1
24. CARR DRA 230.0 DRYFORK 230.0 1
25. CARR DRA 230.0 WYODAK 230.0 1
26. CARTERMT 115.0 MEETSETP 115.0 1
27. CARTERMT 115.0 THERMOPL 115.0 1
28. CARTERMT 69.0 CARTERMT 115.0 1
29. CARTERMT 69.0 CMTDUM 69.0 1
30. CASPERPP 115.0 CASPERLM 115.0 1
31. CASPERPP 115.0 CASPERPP 69.0 1
32. CASPERPP 115.0 CASPERPP 69.0 2
33. CASPERPP 115.0 REFNRYTP 115.0 1
34. CASPERPP 230.0 CASPERPP 115.0 1
35. CASPERPP 230.0 CLAIMJPR 230.0 1
36. CASPERPP 230.0 DAVEJOHN 230.0 1
37. CASPERPP 230.0 MIDWEST 230.0 1
38. CASPERPP 230.0 RIVERTON 230.0 1
39. COPPERMT 115.0 RADERVIL 115.0 1
40. DAVEJO&1 230.0 DAVEJOHN 230.0 1
41. DAVEJO&1 230.0 SPENCE 230.0 1
42. DAVEJOHN 115.0 DAVEJTPN 115.0 1
43. DAVEJOHN 115.0 DAVEJTPS 115.0 1
44. DAVEJOHN 230.0 DAVEJOHN 115.0 1
45. DAVEJOHN 230.0 DIFICULT 230.0 1
46. DAVEJOHN 230.0 HARTZOG 230.0 1
47. DAVEJOHN 230.0 LAR.RIVR 230.0 1
48. DAVEJOHN 230.0 STEGALL 230.0 1
49. DAVEJOHN 230.0 YELLOWCK 230.0 1
50. DUTONBAS 115.0 ERVAYBAS 115.0 1
51. FRANNIE 230.0 GARLAND 230.0 1
52. FRANNIE 230.0 YELOWTLP 230.0 1
53. GARLAND 230.0 OREBASIN 230.0 1
54. GARLAND 69.0 LOVELL 69.0 1
55. GARLAND 69.0 POWELLTP 69.0 1
56. GLENDLTP 69.0 HEART MT 69.0 1
57. GOOSE CK 230.0 SHERIDAN 230.0 1
58. GOOSE CK 230.0 YELOWTLP 230.0 1

59. GRASS CK 230.0 OREBASIN 230.0 1
60. GRASS CK 230.0 THERMOPL 230.0 1
61. HDOME 115.0 HDOME 69.0 1
62. HDOME 115.0 JIMRDYTP 115.0 1
63. HDOME 69.0 CMTDUM 69.0 1
64. HEART MT 69.0 N. CODY 69.0 1
65. JIMREADY 115.0 JIMRDYTP 115.0 1
66. KAYCEE 230.0 MIDWEST 230.0 1
67. LOVELL 115.0 NAHNEJEN 115.0 1
68. LOVELL 115.0 YELLOWBR 115.0 1
69. LOVELL 115.0 YELLOWBR 115.0 2
70. LOVELL 69.0 LOVELL 115.0 1
71. MIDWEST 230.0 CLAIMJPR 230.0 1
72. MIDWEST 230.0 MIDWEST 69.0 1
73. MIDWEST 230.0 MIDWEST 69.0 2
74. MUSTANG 230.0 SPENCE 230.0 1
75. N. CODY 69.0 RALSTON 69.0 1
76. OREBASIN 230.0 OREBASIN 69.0 1
77. PILOT BU 115.0 HARRSBRG 115.0 1
78. PILOT BU 115.0 PILOT BU 69.0 1
79. PILOT BU 115.0 PILOT BU 69.0 2
80. PILOT BU 115.0 WINDRIVT 115.0 1
81. POWELLTP 69.0 RALSTON 69.0 1
82. RADERVIL 115.0 ERVAYBAS 115.0 1
83. RIVERTON 115.0 RIVERTON 230.0 1
84. RIVERTON 115.0 WINDRIVT 115.0 1
85. RIVERTON 230.0 THERMOPL 230.0 1
86. RIVERTON 230.0 WYOPO 230.0 1
87. RMRK PHA 161.0 YELOWTLP 161.0 1
88. SHERIDAN 230.0 TONGRIVR 230.0 1
89. TCAPS 115.0 JIMRDYTP 115.0 1
90. TCAPS 115.0 THERMOPL 115.0 1
91. THERMOPL 115.0 WORLANTP 115.0 1
92. THERPACE 115.0 THERMOPL 115.0 1
93. THERPACE 115.0 THERMOPL 115.0 2
94. THERPACE 115.0 THERMOPL 230.0 1
95. THERPACE 115.0 THERMOPL 230.0 2
96. THERPACE 115.0 WORLAND 115.0 1
97. WINDRIVR 115.0 WINDRIVT 115.0 1
98. WORLAND 115.0 WORLANTP 115.0 1
99. WYODAK 230.0 DONKYCRK 230.0 1
100. WYODAK 230.0 HUGHES 230.0 1
101. WYODAK 230.0 OSAGE 230.0 1
102. WYODAK 230.0 WYODAK 69.0 1
103. WYODAK 230.0 WYODAK 69.0 2
104. YELLOWBR 115.0 YELLOWBR 230.0 1
105. YELLOWBR 115.0 YELLOWBR 230.0 2
106. YELLOWBR 230.0 CROS PHA 230.0 1
107. YELOWTLP 230.0 YELLOWBR 230.0 1
108. YELOWTLP 230.0 YELOWTLP 161.0 1
109. RIVERTON 230.0 DISGEN 230.0 1
110. THERMOPL 230.0 DISGEN 230.0 1

Appendix B: Monitored Buses

ANT MINE 230.00
BADWATER 230.00
BUFFALO 230.00
CARR DRA 230.00
CASPERPP 230.00
CASPERPP 115.00
DAVEJO&1 230.00
DAVEJOHN 230.00
DAVEJOHN 115.00
FRANNIE 230.00
GARLAND 230.00
GOOSE CK 230.00
GRASS CK 230.00
KAYCEE 230.00
MIDWEST 230.00
OREBASIN 230.00
RIVERTON 230.00
SHERIDAN 230.00
SPENCE 230.00
THERMOPL 230.00
THERPACE 115.00
WORLAND 115.00
WYODAK 230.00
YELLOWCK 230.00
YELOWTLP 230.00
YELOWTLP 161.00
CLAIMJPR 230.00
BASIN 115.00
BGEORGE 69.000
BGEORGE 115.00
BOYSEN 115.00
BUFFBILL 69.000
CARTERMT 69.000
CARTERMT 115.00
COPPERMT 115.00
GARLAND 69.000
GLENDLTP 69.000
HDOME 115.00
HEART MT 69.000
JIMREADY 115.00
LOVELL 69.000
LOVELL 115.00
N. CODY 69.000
PILOT BU 115.00
POWELLTP 69.000
RADERVIL 115.00
RALSTON 69.000
RIVERTON 115.00
TCAPS 115.00
THERMOPL 115.00
WINDRIVR 115.00
WINDRIVT 115.00
WORLANTP 115.00
YELLOWBR 115.00
YELLOWBR 230.00
JIMRDYTP 115.00
DUTONBAS 115.00
ERVAYBAS 115.00
NAHNEJEN 115.00
PILOT BU 69.000
BUFFBLPP 69.000
HARRSBRG 115.00
BUFBASIN 69.000
HDOME 69.000
CMTDUM 69.000
MEETSETP 115.0

Appendix C: Monitored elements:

ALCOVA 115.0 RADERVIL 115.0 1
ANT MINE 230.0 TEKLA 230.0 1
ANT MINE 230.0 YELLOWCK 230.0 1
BADWATER 230.0 SPENCE 230.0 1
BADWATER 230.0 THERMOPL 230.0 1
BASIN 115.0 NAHNEJEN 115.0 1
BASIN 115.0 WORLANTP 115.0 1
BGEORGE 115.0 LOVELL 115.0 1
BGEORGE 115.0 MEETSETP 115.0 1
BGEORGE 69.0 BGEORGE 115.0 1
BGEORGE 69.0 GLENDLTP 69.0 1
BLGS PHA 230.0 YELOWTLP 230.0 1
BOYSEN 115.0 COPPERMT 115.0 1
BOYSEN 115.0 HARRSBRG 115.0 1
BOYSEN 115.0 THERMOPL 115.0 1
BUFBASI N69.0 CMTDUM 69.0 1
BUFFALO 230.0 CARR DRA 230.0 1
BUFFALO 230.0 KAYCEE 230.0 1
BUFFALO 230.0 SHERIDAN 230.0 1
BUFFBILL 69.0 BUFFBLPP 69.0 1
BUFFBILL 69.0 HEART MT 69.0 1
BUFFBILL 69.0 N. CODY 69.0 1
CARR DRA 230.0 BARBERCK 230.0 1
CARR DRA 230.0 DRYFORK 230.0 1
CARR DRA 230.0 WYODAK 230.0 1
CARTERMT 115.0 MEETSETP 115.0 1
CARTERMT 115.0 THERMOPL 115.0 1
CARTERMT 69.0 CARTERMT 115.0 1
CARTERMT 69.0 CMTDUM 69.0 1
CASPERPP 115.0 CASPERLM 115.0 1
CASPERPP 115.0 CASPERPP 69.0 1
CASPERPP 115.0 CASPERPP 69.0 2
CASPERPP 115.0 REFNRYTP 115.0 1
CASPERPP 230.0 CASPERPP 115.0 1
CASPERPP 230.0 CLAIMJPR 230.0 1
CASPERPP 230.0 DAVEJOHN 230.0 1
CASPERPP 230.0 MIDWEST 230.0 1
CASPERPP 230.0 RIVERTON 230.0 1
COPPERMT 115.0 RADERVIL 115.0 1
DAVEJO&1 230.0 DAVEJOHN 230.0 1
DAVEJO&1 230.0 SPENCE 230.0 1
DAVEJOHN 115.0 DAVEJTPN 115.0 1
DAVEJOHN 115.0 DAVEJTPS 115.0 1
DAVEJOHN 230.0 DAVEJOHN 115.0 1
DAVEJOHN 230.0 DIFICULT 230.0 1
DAVEJOHN 230.0 HARTZOG 230.0 1
DAVEJOHN 230.0 LAR.RIVR 230.0 1
DAVEJOHN 230.0 STEGALL 230.0 1
DAVEJOHN 230.0 YELLOWCK 230.0 1
DUTONBAS 115.0 ERVAYBAS 115.0 1
FRANNIE 230.0 GARLAND 230.0 1
FRANNIE 230.0 YELOWTLP 230.0 1
GARLAND 230.0 OREBASIN 230.0 1
GARLAND 69.0 LOVELL 69.0 1
GARLAND 69.0 POWELLTP 69.0 1
GLENDLTP 69.0 HEART MT 69.0 1
GOOSE CK 230.0 SHERIDAN 230.0 1
GOOSE CK 230.0 YELOWTLP 230.0 1
GRASS CK 230.0 OREBASIN 230.0 1
GRASS CK 230.0 THERMOPL 230.0 1
HDOME 115.0 HDOME 69.0 1
HDOME 115.0 JIMRDYTP 115.0 1
HDOME 69.0 CMTDUM 69.0 1
HEART MT 69.0 N. CODY 69.0 1
JIMREADY 115.0 JIMRDYTP 115.0 1
KAYCEE 230.0 MIDWEST 230.0 1
LOVELL 115.0 NAHNEJEN 115.0 1
LOVELL 115.0 YELLOWBR 115.0 1
LOVELL 115.0 YELLOWBR 115.0 2
LOVELL 69.0 LOVELL 115.0 1
MIDWEST 230.0 CLAIMJPR 230.0 1
MIDWEST 230.0 MIDWEST 69.0 1
MIDWEST 230.0 MIDWEST 69.0 2
MUSTANG 230.0 SPENCE 230.0 1
N. CODY 69.0 RALSTON 69.0 1
OREBASIN 230.0 OREBASIN 69.0 1
PILOT BU 115.0 HARRSBRG 115.0 1
PILOT BU 115.0 PILOT BU 69.0 1
PILOT BU 115.0 PILOT BU 69.0 2
PILOT BU 115.0 WINDRIVT 115.0 1
POWELLTP 69.0 RALSTON 69.0 1
RADERVIL 115.0 ERVAYBAS 115.0 1
RIVERTON 115.0 RIVERTON 230.0 1
RIVERTON 115.0 WINDRIVT 115.0 1
RIVERTON 230.0 THERMOPL 230.0 1
RIVERTON 230.0 WYOPO 230.0 1
RMRK PHA 161.0 YELOWTLP 161.0 1
SHERIDAN 230.0 TONGRIVR 230.0 1
TCAPS 115.0 JIMRDYTP 115.0 1
TCAPS 115.0 THERMOPL 115.0 1
THERMOPL 115.0 WORLANTP 115.0 1
THERPACE 115.0 THERMOPL 115.0 1
THERPACE 115.0 THERMOPL 115.0 2
THERPACE 115.0 THERMOPL 230.0 1
THERPACE 115.0 THERMOPL 230.0 2
THERPACE 115.0 WORLAND 115.0 1
WINDRIVR 115.0 WINDRIVT 115.0 1
WORLAND 115.0 WORLANTP 115.0 1
WYODAK 230.0 DONKYCRK 230.0 1
WYODAK 230.0 HUGHES 230.0 1
WYODAK 230.0 OSAGE 230.0 1
WYODAK 230.0 WYODAK 69.0 1
WYODAK 230.0 WYODAK 69.0 2
YELLOWBR 115.0 YELLOWBR 230.0 1
YELLOWBR 115.0 YELLOWBR 230.0 2
YELLOWBR 230.0 CROS PHA 230.0 1
YELOWTLP 230.0 YELLOWBR 230.0 1
YELOWTLP 230.0 YELOWTLP 161.0 1

Eastern Shoshone Tribe and Northern Arapahoe
on the Wind River Indian Reservation

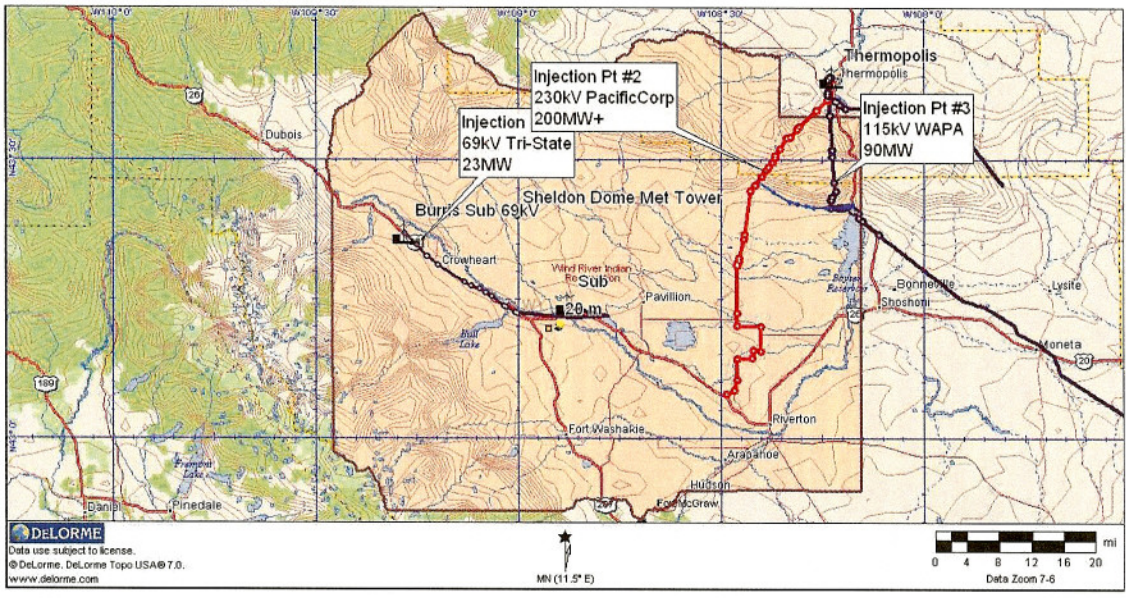
Renewable Energy Development on Tribal Lands
DE-PS36-04GO94003

Appendix 4

Economics and Development Options

Background

Distributed Generations Systems, Inc. was contracted to conduct a wind energy feasibility study for Eastern Shoshone Tribe and Northern Arapahoe Tribe on the Wind River Indian Reservation located within the State of Wyoming. This wind energy study assessed the feasibility of a commercial wind facility on lands selected and entrusted by the Wind Rivers Tribes in areas called Sheldon Dome and Bighorn Flats.



The wind resource at Sheldon Dome (SD) and Bighorn Flats (BF) proved to be on the low side for the Wyoming market. The average wind speed was 15.8 mph at 50m and the capacity factors ranged from 30 to 32% for various wind turbines (Wind Resource Assessment Report). Most of the wind energy development is located in southeast corner of Wyoming where capacity factors range in the mid 40 percentile. The nearest transmission line to both SD and BF is the Tristate Generation and Transmission 69kV line running from the Burris substation to the Pilot substation. The transmission report indicates a 23MW capability, currently.

DISGEN has performed a preliminary economic evaluation for a proposed wind energy project using a 22 MW project as basis for the analysis and a commercially available wind turbine. This section will discuss options that the Tribe may pursue in developing wind energy on Tribal lands. These options include Tribal Ownership, Land Lease, Joint Venture, and No Action.

Project Assumptions:

Size:	23. MW, 11 Wind Turbines, Suzlon S88 2100kW
Gross Capacity Factor:	34.6%
Total Capital Cost:	$48,100,000 (Estimated)
Project Area:	Tribal Trust Lands on Sheldon Dome
Energy Prices:	$45.00 per MWh (Targeted) escalating at 2.5% annually for 20 years.
Taxes:	Tribe is tax-exempt. No Sales taxes,
Interconnection	69kV Line, Tri-State Generation and Transmission, Bighorn Electric Coop is a member.

1. Tribal Ownership

The attached preliminary set of economics demonstrates the initial energy prices that the Tribe must obtained to make a wind energy project viable as owners. The economics were completed using the assumption that the tribe has the financial resources to develop and own a wind energy project without incurring any debt. Approximately $48,100,000 of available funds would be needed to completely construct a 23 MW wind energy project interconnected to the 69kV line. The Tribe should expect to spend a least $900,000 to $1,500,000 on the pre-construction and development activities. These pre-construction activities include conducting an environmental assessment, federal permitting, procuring wind turbines, procuring a power purchase agreement, interconnection activities and accessing funds.

Using all of these assumptions, the preliminary project economics indicates that the project would need a beginning contract price of $ 0.045 per kWh to make it economically viable to construct under a Tribal ownership scenario in which the tribe would break-even (0% IRR). In the normal financial market today, investors are looking at minimum of 9% IRR for a project without debt. So the beginning price for a tribal project to make 9% IRR is $0.085 per kWh. In the Wyoming market, it really unlikely that any utility will accept this price.

2. Passive Participants (Land Lease)

If the Tribe wishes to pursue commercial wind energy project as a passive participant by leasing the project area to a developer then the project economics change. A developer or investor with a tax appetite can utilized the available federal production tax credit, which has an enormous economic benefit to the project. Unfortunately, Tribes are unable to take advantage of the tax credit since Tribes are tax-exempt. In this scenario, the Tribe can lease trust land to the project owner and get a royalty payment when the project is in operation. The project owner/developer will finances the project and reap the tax benefit and also incurs any state tax liabilities.

If the Tribe is able to negotiate a lease agreement to develop a 23MW (11 turbines) wind project using the acquired wind data and capacity factors, gross revenue share, and TERO fees. The tribal economic benefit from a 23 MW wind project could be as follows;

a. Most private wind energy developers negotiate a land easement agreement with land owners that has annual royalty payment for gross energy production at 3.5%. For a 23 MW project using the capacity factor of 34%, the annual lease payment would start at $95,000 to the Tribe and escalate to $147,000. The economic benefit to Tribe during the life of the power purchase agreement, 25 years, the total economic benefit would be at least $2,900,000.

b. If the Tribal Employment Rights Office (TERO) is applied then the tax of 2% of the capital project cost ($48,100,000) would be as much as $962,000 to the Tribe. If the wind farm is conducted on the reservation, the TERO tax applies at 2% of gross revenue, so the estimated revenue from the gross sales would be about $54,000.

c. At least 40-60 short term construction jobs would be available to tribal members.

d. At least 2-3 potential permanent jobs would be available to tribal members for caretaking the wind farm.

e. No out of pocket funding toward the project is required from the Tribe.

Other benefits that could be included;

f. Develop tribal experience in renewable energy and to position the Tribe to participate in their energy development. Unlike other fossil fuel resources, the wind resource will be available after the land lease has expired.

g. If negotiated, the project owners could sell the project to Tribe once lease expires.

The land lease option may be attractive to the Tribes if the annual cash flow is acceptable and that no out-of-pocket funding will be needed to complete the project. The Tribes have to keep in mind that additional taxes and fees to the project could make the project to expensive to finance.

3. Joint Venture (Market Position Development)

If the Tribe wishes to participate in the development and preconstruction activities for this wind energy project then the Tribe would need to commit resources to the activities with the goal of attracting a willing investment partner to use the production tax credits.

In this scenario, the Tribe would continue to receive the economic benefits of the land lease scenario and jobs but with an option to be proactive in the development of their own lands and possible ownership of the project over time. The ownership capability is greatly increased when the Tribe actively participates in the development work.

The Tribe would need to commit personnel to facilitate and manage the development activities. The cost for the development activities would be approximately $900,000 to $1,500,000 to complete the pre-development work for at 23MW project. The development activities in the following:

1. Continued Wind Resource Assessment. Investor strongly advises the wind sites to gather wind data for at least 3 years.
2. Interconnection Studies. These studies are required from the utility and FERC to facilitate the interconnection of the wind facility. These studies cost between $150,000 to $300,000 and take over 8 months to perform.
3. Environmental Assessment per NEPA Regulations. Since the project site is on federal trust land, it is necessary to gather the required studies to complete a Environmental Assessment document. Under federal rules these NEPA studies will have to be completed prior to any financing.
4. Acceptable Financing Structures.
5. Power Purchase Agreement procurement
6. Wind Turbine Equipment procurement
7. Geotechnical Activities
8. Facilitating Federal involvement such as Bureau of Indian Affairs, US Dept of Fish and Wildlife and the EPA.

4. No Action

If the Tribe chooses not to participate in the development of the wind energy project at this time, then no action is needed.

Project Assumptions

Turbine Manufacturer		Suzlon			
Turbine Type		S88			
Number of Turbines		11			
KW Rating	kW	2,100			
Capacity Installed	MW	23.10	assume		
Turbine Price (including tower)	$	2,900,000	$	1,381	$/kW
Gross Annual kWh per Turbine	kWh	6,320,401			
Net Output as Percent of Gross	%	89.0%			
Net Annual kWh per Turbine	kWh	5,625,157			
Availability	%	97.0%			
Annual Production to Meter per Turbine	kWh	5,456,402			
Total Annual Production to Meter	MWh	60,020			
Net Capacity Factor	%	29.66%			
Annual Decrease In Availability	%	0.00%			
Project Life	years	25			
1st Year of Operation	yyyy	2011			
1st Month of Operation	number	1			
1st Year Percent for Operating Costs	%	100.0%			
1st Year Percent for kWh Production	%	100.0%			
Base Year for Capital Costs	yyyy	2011			
Construction Loan Closing	mm/dd/yy	09/01/09			
Permanent Loan Closing	mm/dd/yy	10/01/10			
Initial Spare Parts	$	100,000			
Initial O&M/Mgt. Payment	no. of mo.	3			
Percent of 1st Year Interest	%	25.0%			
Base Construction Cost per Turbine	$	650,000	650,000	$310 / kw	
Construction Contingency	%	7%			
First Year in Financial Model		2011			
Final Year in Financial Model		2035			
Electricity Purchaser		Begin	End		
IOU Purchaser		12/1/2011	12/31/2032 ???		
Avoided Cost Purchaser		1/1/2033	11/30/2036 ???		
Contract Term	yrs	20			

PRODUCTION PER CONTRACT TERM

IOU Purchaser			Begin	End
Phase 1	%	50%	2011	2030
Phase 2	%	25%	2011	2030
Phase 3	%	25%	2011	2030

need to fix production %: **cannot be = 0% as currently modeled**

Wind River, 23MW, no Taxes

Energy Sale Prices

20 yr After Tax ROR 10yr ROR
8.4%

Base Energy Prices	Begin Yr.	End Yr.	Contract Pricing	Avoided Cost	
Tranche 1	2011	2035	7.900	3.00	cents/kWh
Tranche 2	2036	2050	0.00	0.00	cents/kWh
Tranche 3	2051	2051	0.00	0.00	cents/kWh
Capacity Payment	2052	2052	0.00	0.00	$/kW-yr

Escalation of Contract Energy Prices

Tranche 1	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%
Tranche 2	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%
Tranche 3	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%
Capacity Payment	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%

Escalation of Avoided Cost Energy Prices

Tranche 1	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%
Tranche 2	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%
Tranche 3	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%
Capacity Payment	Yrs Starting:	2011	2028	2032
	Rate	2.5%	2.5%	2.5%

Base Year (EOY) 2011

Debt Financing

Senior Loan

		Amortized	Cover. Ratios - Senior Debt	
			Minimum	Average
% Debt (if amort) or Coverage Ratio		0%	1.02	1.02
Fixed Interest Rate		6.00%		
Amortization Period (Years)		20		
Interest Only Period (Years)				
			Average Life (Years)	
Total Term		20	N/A	
Variable Coverage Ratio	Yrs Starting:	2011	2007	2010
	Percent			
Initial Loan Fee	1.00%			
Annual Agency Fee	$ -			

Other Debt

	Amortized	Cover. Ratios - Total Debt	
		Minimum	Average
% Debt (if amort) or Coverage Ratio	0%	1.02	1.02
Interest Rate	8.25%		
Term (Years)	15		
Interest Only Period (Years)	1		
		Average Life (Years)	
Total Term	16	N/A	

Debt Service Reserve

Debt Service Reserve (% of Annual)	50%
Initial DSR (% of 1st Year Debt Service)	50%
% of Cash Flow to Fund Reserve	50%

Construction Debt

Construction Loan?	(Yes/No)	No
Amount	% of Cost	71%
Interest Rate	%	6.5%
Commitment Fee on Unused Funds	%	0.5%
Initial Loan Fee	%	1.0%

Wind River, 23MW, no Taxes

Operations and Maintenance Expenses

Base Year		2010		
Operations & Maintenance Fee Options				
Cents/kWh (escalating)	cents	0.00		
Fixed Annual Pmt (escalating)	$	5,000		
Fixed Annual Pmt per Turbine (escalating)	$	25,000		
Percent of Revenues	%	0.00%		
% of Total O&M Subordinated	%	0.00%		
1st Year/Month Fees Begin		2011	1	
Landowner Pymt Options				
Fixed Annual Pymt	$		Yr 1 Landowner Fee:	69,323.59
Per kW (esc)	$	0.00	# of kW:	23,100
% of Revenues (fixed)	%	0.00%	$/kW (esc):	3.00
% of Revenues (variable)		Year	Percent	
Applied to Yrs Starting		2011		
Applied to Yrs Starting		2022		
Applied to Yrs Starting		2020		
Minimum Annual Pymt	$/Turbine			
		1		
Standby Electric Rate (escalating)	$/kWh	0.050		
Standby Electric Consumption	kWh	289,080		
Interconnect Fee to Utility (fixed $/KW-yr)	$	-		
Insurance/kW (escalating)	$	7.50		
Administration (esc)	$	-		
Audit/Legal/Miscellaneous (esc)	$	30,000		
Management Oversight Expense (esc)	$	75,000		
Tribal Educational Trust	$	-		
Other Expense (% of rev)	%	0.0%		
Other Expense (constant)	$	-		
Other Expense Subordinated (esc)	$	-		
Developer Subordinated Fee (% of rev)	%	0.0%		

Interest Rate (Income) on Debt Resv/Cash		2.0%
Accrued Interest as a % of Cash Interest Pymt		100%
Working Capital Requirement as % of 1st Year Expenses		8.0%
Capital Costs & General Inflation	(all years)	2.0%
Operating Expense Escalation	(all years)	2.0%
Book Life of Project	years	25
Amortization Period for Intangible Assets	years	5

Income & Other Taxes

Income Taxes

	Federal	WY		
Tax Rates	0.00%	0.00%	Yr Placed in Service	2011
			Short first yr?	No
At-Risk Limitations?	No	No	1st Year Percent	100.0%
Utilize Tax Losses?	No	No		

	Depr Methods Code	Type	Yrs or DB%	DB/SL Yrs	Book Life	D/A
Facility Costs	1	MACRS	5		25	D
Interconnect Costs	2	SL	20		25	D
Loan Expenses	3	SL	20		20	A
Organizational Costs	4	SL	5		5	A

1st Yr PTC	cents/kWh	-	ITC	0	1=yes, 0=no
PTC Base Year	yyyy	2011	30%	$ 13,450	k
Last Year of PTC	yyyy	2020			
PTC Annual Escalation	%	1.5%			

Property Taxes

Cost of Equipment	44,834,500	turbines and blades exempt
Assessed Value as Percent	0.0%	50% abatement
Mil Rate ($ per $1000)	21.800	
Decr in Prop Value/Yr	12.5%	
Min. Mil Rate (% of orig.)	20%	

Sales Taxes

Rate	0.00%

Wind River, 23MW, no Taxes

Internal Rates of Returns/Development Fees

Internal Rates of Return

	Returns		ApproxUnleveragedReturns
Years	Pre-tax	After-tax	Pre-tax
5+			
10+			
15+	5.9%	5.9%	6.1%
20+	8.4%	8.4%	8.6%
25+	8.8%	8.8%	9.0%
30+	8.8%	8.8%	9.0%

Development Fees

Base Development Fee	% of cost	2.5% of first	200	MW
Additional Development Fee	% of cost	0.0% all over	200	MW

Sources and Uses of Funds

Wind River, 23MW, no Taxes

SOURCES		Unit Price	Units	Percent	Amount	
	Senior Loan			0.0%		
	Other Debt			0.0%		
	Equity			100.0%	48,090,010	
	Total Sources			100.0%	48,090,010	
USES						
1.0	**Wind Turbine Cost**					
1.01	Wind Turbines and Towers	2,750,000	11	62.9%	30,250,000	
1.02	Extended Warranty	108,000	11	2.5%	1,188,000	
1.03	Shipping and Packing	200,000	11	4.6%	2,200,000	
1.04	Sales Tax	0	11	0.0%	0	
	Subtotal			69.9%		33,638,000
2.0	**Balance of Construction**					
2.01	Base Construction Cost	650,000	11	14.9%	7,150,000	
2.02	Low Voltage Ride Through	670,000	1	1.4%	670,000	
2.03	Substation	2,600,000	1	5.4%	2,600,000	
2.04	SCADA	94,000	1	0.2%	94,000	
2.05	Construction Interest			0.0%		
2.06	Construction Contingency			1.4%	682,500	
2.07	Sales Tax			0.0%	0	
	Subtotal Construction			23.3%		11,196,500
3.0	**Working Capital and Initial Operating Expenses**					
3.01	Working Capital Funding			0.1%	47,667	
3.02	Spare Parts			0.2%	100,000	
3.03	First Half -Year Insurance Premium			0.2%	86,625	
3.04	Initial Operations and Management Fee			0.1%	71,400	
3.05	Other Initial Operating Expense			0.9%	445,517	
	Subtotal Working Capital and Initial Operating Expenses			1.6%		751,209
3.0	**Lender Transaction Expenses**					
3.01	Legal Expenses			0.0%		
3.02	Construction Loan Fee			0.0%	-	
3.03	Permanent Loan Fee			0.0%	-	
3.04	Lender Consulting Expenses			1.5%	721,350	
3.05	Other Lender Costs			0.0%	-	
3.06	Title Insurance			0.0%	5,000	
3.07	Other			0.0%	-	
3.08	Initial Debt Reserve Funding			0.0%	-	
3.09	First Year Agency Fee			0.0%	-	
	Subtotal Lender Transaction Expenses			1.5%		726,350
4.0	**Equity Financing and Other Expenses**					
4.01	Equity Consulting Expenses			0.0%	-	
4.02	Development Costs			0.0%	-	
4.03	Legal Expenses			0.3%	150,000	
4.04	Organizational Costs			0.0%	5,000	
	Subtotal Equity Financing and Other Expenses			0.3%		155,000
5.0	**Development Costs and Fees**					
5.01	Developer Development Cost Reimbursement			0.7%	350,000	
5.02	Other Development Cost Reimbursement			0.2%	100,000	
5.03	Base Development Fee			2.4%	1,172,927	
5.04	REC Sales			0.0%		
5.05	Project Construction Management			0.0%	-	
5.06	Land Owner Installation Fee	1	23	0.0%	23	
5.07	Development Contingency			0.0%	-	
	Subtotal Development Costs and Fees			3.4%		1,622,950
	Total Budget			100.0%		48,090,010

Income Statement

Wind River, 23MW, no Taxes
0

	Closing	2011	2012	2013	2014	2015	2016	2017
		1	2	3	4	5	6	7
Operating Revenue								
Capacity Sales								
Electricity Sales		4,742	4,860	4,982	5,106	5,234	5,365	5,499
Total Revenues		4,742	4,860	4,982	5,106	5,234	5,365	5,499
Operating Expenses								
Operations & Maintenance		286	291	297	303	309	315	322
Landowner Payments		-	-	-	-	-	-	-
Interconnect and Electricity Consumption		15	15	15	16	16	16	17
Insurance		177	180	184	188	191	195	199
General and Administrative		-	-	-	-	-	-	-
Audit, Legal, Miscellaneous		31	31	32	32	33	34	34
Property Taxes Trust land		-						
Management		77	78	80	81	83	84	86
Lender Agency Fee		-	-	-	-	-	-	-
Other		-	-	-	-	-	-	-
Total Operating Expenses		584	596	608	620	632	645	658
NET OPERATING INCOME		4,157	4,264	4,374	4,486	4,602	4,720	4,841
Depreciation								
Amortization								
Subordinated Developer Fee								
Interest Income		(21)	(43)	(44)	(45)	(46)	(47)	(48)
Interest Expense								
PRETAX INCOME		4,178	4,307	4,418	4,531	4,648	4,767	4,889
Production Tax Credit								
Tax Provision								
NET INCOME		4,178	4,307	4,418	4,531	4,648	4,767	4,889

Income Statement

Wind River, 23MW, no Taxes
0

	2018	2019	2020	2021	2022	2023	2024	2025
	8	9	10	11	12	13	14	15
Operating Revenue								
Capacity Sales								
Electricity Sales	5,636	5,777	5,922	6,070	6,221	6,377	6,536	6,700
Total Revenues	5,636	5,777	5,922	6,070	6,221	6,377	6,536	6,700
Operating Expenses								
Operations & Maintenance	328	335	341	348	355	362	369	377
Landowner Payments	-	-	-	-	-	-	-	-
Interconnect and Electricity Consumption	17	17	18	18	18	19	19	19
Insurance	203	207	211	215	220	224	229	233
General and Administrative	-	-	-	-	-	-	-	-
Audit, Legal, Miscellaneous	35	36	37	37	38	39	40	40
Property Taxes Trust land								
Management	88	90	91	93	95	97	99	101
Lender Agency Fee	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-
Total Operating Expenses	671	684	698	712	726	741	756	771
NET OPERATING INCOME	4,965	5,093	5,224	5,358	5,495	5,636	5,781	5,929
Depreciation								
Amortization								
Subordinated Developer Fee								
Interest Income	(50)	(51)	(52)	(54)	(55)	(56)	(58)	(59)
Interest Expense								
PRETAX INCOME	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Production Tax Credit								
Tax Provision								
NET INCOME	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988

Income Statement

Wind River, 23MW, no Taxes
0

	2026	2027	2028	2029	2030	2031	2032	2033
	16	17	18	19	20	21	22	23
Operating Revenue								
Capacity Sales								
Electricity Sales	6,867	7,039	7,215	7,395	7,580	2,951	3,024	3,100
Total Revenues	6,867	7,039	7,215	7,395	7,580	2,951	3,024	3,100
Operating Expenses								
Operations & Maintenance	384	392	400	408	416	424	433	442
Landowner Payments	-	-	-	-				
Interconnect and Electricity Consumption	20	20	21	21	21	22	22	23
Insurance	238	243	247	252	257	263	268	273
General and Administrative	-	-	-	-				
Audit, Legal, Miscellaneous	41	42	43	44	45	45	46	47
Property Taxes Trust land								
Management	103	105	107	109	111	114	116	118
Lender Agency Fee	-	-	-	-	-	-	-	-
Other	-	-	-	-				
Total Operating Expenses	786	802	818	834	851	868	885	903
NET OPERATING INCOME	6,081	6,237	6,397	6,561	6,729	2,082	2,139	2,197
Depreciation								
Amortization								
Subordinated Developer Fee								
Interest Income	(61)	(62)	(64)	(66)	(67)	(21)	(21)	(22)
Interest Expense								
PRETAX INCOME	6,142	6,299	6,461	6,627	6,796	2,103	2,160	2,219
Production Tax Credit								
Tax Provision								
NET INCOME	6,142	6,299	6,461	6,627	6,796	2,103	2,160	2,219

Income Statement

Wind River, 23MW, no Taxes
0

	2034	2035						
	24	25						
Operating Revenue								
Capacity Sales								
Electricity Sales	3,177	3,257						
Total Revenues	3,177	3,257						
Operating Expenses								
Operations & Maintenance	450	459						
Landowner Payments								
Interconnect and Electricity Consumption	23	24						
Insurance	279	284						
General and Administrative								
Audit, Legal, Miscellaneous	48	49						
Property Taxes Trust land								
Management	121	123						
Lender Agency Fee	-	-	-	-	-	-	-	
Other								
Total Operating Expenses	921	940						
NET OPERATING INCOME	2,256	2,317						
Depreciation								
Amortization								
Subordinated Developer Fee								
Interest Income	(23)	(23)						
Interest Expense								
PRETAX INCOME	2,279	2,340						
Production Tax Credit								
Tax Provision								
NET INCOME	2,279	2,340	0	0	0	0	0	

Cash Flow Statement

Wind River, 23MW, no Taxes
0

		2011	2012	2013	2014	2015	2016	2017
PRETAX INCOME		4,178	4,307	4,418	4,531	4,648	4,767	4,889
Increased by:								
Book Depreciation								
Book Amortization								
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes		4,178	4,307	4,418	4,531	4,648	4,767	4,889
Decreased by:								
Interest Payments		0	0	0	0	0	0	0
Principal Payments		0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes		4,178	4,307	4,418	4,531	4,648	4,767	4,889
Debt Reserve Releases (Additions)								
Equity Investment	(48,090)							
PRETAX CASH FLOW	(48,090)	4,178	4,307	4,418	4,531	4,648	4,767	4,889
Production Tax Credit		0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	(48,090)	4,178	4,307	4,418	4,531	4,648	4,767	4,889

Cash Flow Statement

Wind River, 23MW, no Taxes

	2018	2019	2020	2021	2022	2023	2024	2025
PRETAX INCOME	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Increased by:								
Book Depreciation								
Book Amortization								
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Decreased by:								
Interest Payments	0	0	0	0	0	0	0	0
Principal Payments	0	0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Debt Reserve Releases (Additions)								
Equity Investment								
PRETAX CASH FLOW	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Production Tax Credit	0	0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988

Cash Flow Statement

Wind River, 23MW, no Taxes
0

		2011	2012	2013	2014	2015	2016	2017
PRETAX INCOME		4,178	4,307	4,418	4,531	4,648	4,767	4,889
Increased by:								
Book Depreciation								
Book Amortization								
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes		4,178	4,307	4,418	4,531	4,648	4,767	4,889
Decreased by:								
Interest Payments		0	0	0	0	0	0	0
Principal Payments		0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes		4,178	4,307	4,418	4,531	4,648	4,767	4,889
Debt Reserve Releases (Additions)								
Equity Investment	(48,090)							
PRETAX CASH FLOW	(48,090)	4,178	4,307	4,418	4,531	4,648	4,767	4,889
Production Tax Credit		0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	(48,090)	4,178	4,307	4,418	4,531	4,648	4,767	4,889

Cash Flow Statement

Wind River, 23MW, no Taxes

	2018	2019	2020	2021	2022	2023	2024	2025
PRETAX INCOME	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Increased by:								
Book Depreciation								
Book Amortization								
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Decreased by:								
Interest Payments	0	0	0	0	0	0	0	0
Principal Payments	0	0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Debt Reserve Releases (Additions)								
Equity Investment								
PRETAX CASH FLOW	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988
Production Tax Credit	0	0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	5,015	5,144	5,276	5,411	5,550	5,692	5,839	5,988

Cash Flow Statement

Wind River, 23MW, no Taxes

	2026	2027	2028	2029	2030	2031	2032	2033
PRETAX INCOME	6,142	6,299	6,461	6,627	6,796	2,103	2,160	2,219
Increased by:								
Book Depreciation								
Book Amortization								
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes	6,142	6,299	6,461	6,627	6,796	2,103	2,160	2,219
Decreased by:								
Interest Payments	0	0	0	0	0	0	0	0
Principal Payments	0	0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes	6,142	6,299	6,461	6,627	6,796	2,103	2,160	2,219
Debt Reserve Releases (Additions)								
Equity Investment								
PRETAX CASH FLOW	6,142	6,299	6,461	6,627	6,796	2,103	2,160	2,219
Production Tax Credit	0	0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	6,142	6,299	6,461	6,627	6,796	2,103	2,160	2,219

Cash Flow Statement

Wind River, 23MW, no Taxes

	2034	2035	0	0	0	0	0
PRETAX INCOME	2,279	2,340					
Increased by:							
Book Depreciation							
Book Amortization							
Subordinated Expenses							
Accrued Interest Expense							
Cash Flow before Debt Service, Reserves & Taxes	2,279	2,340					
Decreased by:							
Interest Payments	0	0	0	0	0	0	0
Principal Payments	0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes	2,279	2,340	0	0	0	0	0
Debt Reserve Releases (Additions)							
Equity Investment							
PRETAX CASH FLOW	2,279	2,340					
Production Tax Credit	0	0	0	0	0	0	0
Income Tax Benefit (Payment)							
AFTER-TAX CASH FLOW	2,279	2,340					

Raphaella Stump

From: Belvin Pete [bpete@disgenonline.com]
Sent: Thursday, August 27, 2009 10:16 AM
To: Jeremy Perry
Cc: Raphaella Stump
Subject: Final Certificate
Attachments: Nrg_equipment.pdf; PropertyCertFINAL.doc

Jeremy,

Attached is the document you need to show that the met tower value is below $5000.00

Print PropertyCertFINAL, Sign it and return to DOE.

The met tower value in 2006 was $7573.00

5 year real property to 20% will be use to calculate depreciation.

80% x 7573.00 / 5 years = 1211.76 per year.

2006-2009= 3 years

3 x 1211.76 = $3636.28 depreciate in 3 years.

7573.00 – 3636.38 = depreciated value.

Value of met tower is $3938.22

Belvin
DISGEN
Distributed Generation Systems, Inc
Native American Programs and Resources
200 Union Blvd, Suite 304
Lakewood, CO 80228
Tel: (303) 531-5523
Fax: (303) 531-5527
Cell: (303) 548-5951
E-mail: bpete@disgenonline.com
Web: www.disgenonline.com

NRG Systems, Inc.
110 Riggs Road, P.O. Box 509
Hinesburg, Vermont 05461 USA
TEL 802-482-2255 FAX 802-482-2272
www.nrgsystems.com

Copy

Commercial Invoice No. INV0026452

DATE 12/22/2006

BILL TO Distributed Generation Systems
200 Union Blvd.
Suite #304

Lakewood CO 80228

SHIP TO Eastern Shoshone Tribe

15 N Fork RD

Ft. Wahakie WY 82514

Contact: Jeremy Perry
Phone: 307-332-3084

PURCHASE ORDER NO.	CUSTOMER ID	SALES ID	SHIPPING METHOD	PAYMENT TERMS	REQ'D SHIP DATE	MASTER NUMBER
	1002	David Simkins	TRUCK-FRT PD	VISA	12/22/2006	37,888

QTY ORDERED	QTY SHIPPED	QTY B/O	ITEM NUMBER	DESCRIPTION	SITE	U OF M
1	1	0	3280	NRG-NOW System 50m - Symphonie TallTower Kit	$4,679.25	$4,679.25
1	1	0	3281	NRG-NOW System 50m - Symphonie Sensor Kit	$1,483.25	$1,483.25
1	1	0	3282	NRG-NOW System 50m - Symphonie Logger Kit - SA	$1,143.25	$1,143.25
1	1	0	1899	NRG #40 Anemometer	$97.75	$97.75
1	1	0	3148	Symphonie SCM Card for #40 Anemometer	$29.75	$29.75
1	1	0	3390	Boom, Side, 1.53m(60.5"), Galv, with clamps	$72.25	$72.25
1	1	0	1933	Sensor Cable, 2C, 20Ga, 42m (138'), for 40m level	$68.00	$68.00
1	1	0	3170	Freight, Handling, Special Labeling / Packaging	$0.00	$0.00
				** NRG LOGISTICS SPECIAL - Delivery Notification Requested, no charge courtesy NRG Systems.		
1	1	0	2000	Freight, Handling, Insurance-Domestic	$0.00	$0.00
				FOB Hinesburg, VT		
				Truck Freight (CON-WAY) Door-to-Door courtesy of NRG Systems.		
				PRO: 322-576520		

Country of Origin: USA.
29 boxes, 1982 lbs

One 10' Skid
Certified true and correct.

Thank You

Subtotal	$7,573.50
Freight	$0.00
Tax	$0.00
Total	$7,573.50
Payment Received	$7,573.50
Total US Dollars Due	$0.00

69915V

U.S. DEPARTMENT OF ENERGY JUNE 2005

FINANCIAL ASSISTANCE
PROPERTY CLOSEOUT CERTIFICATION

Award Number	Recipient *(Name and address)*
DE-PS36-04GO16026	Eastern Shoshone Tribe, 15 North Fork Road, Fort Washakie, WY 82514

The purpose of this report is to facilitate the closeout of the Award. Based on the records maintained by the Recipient in accordance with the Property Management standards set forth in the Award, the following data reflects the Recipient's closeout inventory of real and personal property that was provided by the Department of Energy (DOE) or partially or wholly acquired with project funds.

I. EQUIPMENT

A. **Federally-Owned:** *(Government Furnished Equipment): (10 CFR 600.133(a), 600.232, 600.322, or Federal Demonstration Partnership (FDP) General Terms and Conditions No. 33, as applicable):* ☒ No ☒ Yes

(If yes, attach property inventory list that includes item description, manufacturer, model, serial number, original acquisition date, original acquisition cost and disposal condition code per the Federal Management Regulation 102-36.240)

B. **Equipment Acquired with Award Funds where Title Vests in the Recipient with further obligations to DOE:**
(10 CFR 600.133, 600.134, 600.232, or 600.321, as applicable)

☐ No ☒ Yes

If yes, does the equipment have a per unit fair market value of $5,000 or more? ☒ No ☐ Yes

(If yes, attach a property inventory list that includes item description, manufacturer, model, serial number, original acquisition date, original acquisition cost, disposal condition code per the Federal Management Regulation 102-36-240 and one of the disposition codes listed below)

(1) The property will continue to be used for the purposes authorized in the Award.

(2) The property is no longer needed for the purposes of the Award, and will be used on another Federally sponsored activity *(List Activity and Federal Agency):*

(3) The Recipient wishes to retain the property and compensate DOE for its share of the current per unit fair market value. *(Identify the fair market value on the attached property inventory list and describe how the value was determined).*

(4) The property is no longer needed for the purposes of the Award or other Federally sponsored activities and the Recipient requests DOE disposition instructions.

II. SUPPLIES *(10 CFR 600.135, 600.233, 600.324, or FDP General Terms and Conditions No. 35, as applicable)*

Does the residual inventory of unused supplies exceed $5,000 in total aggregate value? ☒ No ☐ Yes *(if yes, check block below)*

☐ The supplies will be used on another Federally sponsored activity *(List Activity and Federal Agency).*

☐ The supplies will be sold or retained for use on non-Federally sponsored activities and the Recipient will compensate DOE for its share of the sales proceeds (or estimate of current fair market value). Attach a list of the supplies and complete the following Worksheet:

Sale proceeds or estimate of current fair market value..... $_____

Percentage of Federal participation ..... _____%

Federal share ..... $_____

Selling and handling allowance ..... $_____

Amount to be remitted to DOE ..... $_____

U.S. DEPARTMENT OF ENERGY

FINANCIAL ASSISTANCE
PROPERTY CLOSEOUT CERTIFICATION

III. REAL PROPERTY: *(Real Estate - 10 CFR 600.132, /600.231, 600.321, or FDP General Terms and Conditions No. 32, as applicable)* ☐ No ☐ Yes *(If yes, complete A –C)*

A. **Description of Real Property:**

B. **Complete Address of Real Property:**

C. **Period of Federal Interest in the Property:** From _____ To _____ (Unless the award specifies otherwise, the Federal Interest in the property ends when the award project period ends.)

D. **Disposition Preference Request.** If the period of Federal Interest in the property exceeds the project period, check one of the following blocks to indicate your disposition preference:

☐ Transfer property to another Federal award.

☐ Sell and compensate DOE.

☐ Return to DOE.

☐ Retain title and compensate DOE for its share of the current fair market value of the property.

Certification: I certify to the best of my knowledge and belief that all information presented in this report is true, correct and complete, and constitutes a material representation of fact upon which the Federal government may rely.

Name	Signature	Title	Date
Jeremy Perrry		planner	8-27-09

U.S. DEPARTMENT OF ENERGY

FINANCIAL ASSISTANCE
PROPERTY CLOSEOUT CERTIFICATION

To be completed by the Department of Energy:

DOE PROPERTY DISPOSITION

☐ Negative Report

☐ Real Property:

☐ Equipment:

☐ Supplies:

Property Management Official Name	Signature	Date