

Environmental Assessment

Rawlins Field Office

EA Number: DOI-BLM-WY-030-2010-0279-EA Right-of-Way Casefile Number: WYW-166409

1.0 Introduction

Identifying Information:

Applicant: Bureau of Land Management
Project Name: Rawlins Field Office Wind Turbine.
Location: T. 21 N., R. 87 W., Carbon County, Wyoming
Section 17: SW¹/₄NW¹/₄NE¹/₄NW¹/₄

1.1 Background

The RFO constructed a new facility in January 2005. As part of the Bureau of Land Management's (BLM's) commitment to reduce overall energy costs, the facility was designed to conform with the US Green Building Council (USGBC) LEED program. This program provides direction on how to design facilities so as to attain the different ratings (Gold, Silver, etc.). In 2009, the RFO facility was awarded a Gold Rating based on its commitment to utilize green energy from the electrical grid as well as generate its own renewable energy through the installation of a 20 kW wind turbine.

In 2004, the Bureau of Land Management (BLM), Rawlins Field Office (RFO) signed a Decision Record (DR) and Finding of No Significant Impact (FONSI) recommending approval of a wind turbine to generate electrical power for the RFO. This turbine was installed during the Fall of 2005 and came online to generate electricity July 1, 2006.

At the time of the original analysis in 2004, RFO proposed to meet the State of Wyoming regulations which do not allow for on-site generation of more than 25 kW under net metering. The turbine has suffered numerous mechanical problems and associated down time since 2006 resulting in no energy generation for approximately one third of its life. The current turbine is not designed to handle wind speeds, turbulence or elevations found at the site. An alternative turbine design, sufficient to handle the environmental conditions at the site would provide a more reliable source of power. In order to install a turbine that produces more than 25 kW, the RFO would be required to apply for, and operate as, a Qualifying Facility under the Public Utility Regulatory Policies Act (PURPA). To retain the Gold Rating in the LEED program, the RFO needs a more reliable source of energy that requires less maintenance.

1.2 Purpose and Need for the Proposed Action:

The BLM is responsible for the development of energy resources on BLM-administered lands in an environmentally sound manner. BLM's purpose is to fulfill its Wind Energy Development Program policy (Instruction Memorandum No. 2009-043) by encouraging development of wind energy in acceptable areas consistent with the National Energy Policy of 2001 and the Energy Policy Act of 2005 (Public Law 109-58, August 8, 2005).

This EA will provide sufficient information to allow the Authorized Officer (AO) to determine whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI), based on the analysis of potential environmental effects of implementing the proposed action or an alternative described below. Through this process, the BLM's purpose is to avoid, minimize, rectify, reduce, eliminate, or compensate for potential environmental impacts to the extent possible as required by NEPA (40 CFR 1508.20), while encouraging the development of wind energy in acceptable areas as required by BLM policy (IM 2009-043). This EA is written in accordance with the Council on Environmental Quality (43 CFR 1500-1508) and Department of Interior (43 CFR Part 46) regulations for implementation of the National Environmental Policy Act of 1969.

1.3 Decision to be made

The BLM will decide whether or not to approve the action as proposed or an alternative and, if so, under what terms and conditions.

1.4 Relationship to Statutes, Regulations, Policy, Plans or Other Environmental Analyses

1.4.1 Conformance with the Land Use Plan:

The Resource Management Plan was reviewed to determine if the proposed action conforms to the land use plan decisions as required by 43 CFR 1610.5-3. The proposed wind turbine is in conformance with management goals, objectives and actions defined in the Rawlins RMP, as follows:

- Lands and Realty Management Goal: Manage the acquisition, disposal, withdrawal, and use of public lands to meet the needs of internal and external customers (i.e., to respond to community needs for expansion and economic development and to preserve important resource values) (RMP Appendices 6, 7, and 34)(RMP, pg. 2-16).
- Lands and Realty Management Objective: Manage public lands to be consistent with goals and objectives of other resource programs (RMP, pg. 2-16).
- Lands and Realty Management Objective: Respond to internal and external requests ...for land authorizations (RMP, pg. 2-16).
- Lands and Realty Management Action: Areas with important resource values will be avoided (569,0500 acres) or excluded (98,400 acres) in planning for new wind energy facility placement. If it becomes necessary for facilities to be placed within avoidance areas, effects will be intensively managed. (RMP, pg. 2-18)

Descriptions of the affected environment and impact analysis for this EA tier to the “Proposed Resource Management Plan and Final Environmental Impact Statement for the Rawlins Field Office” (RMP FEIS), January, 2008.

1.4.2 Conformance with Statutes and Regulation:

The proposed action is consistent with State and Local government programs, plans, zoning, and regulations that apply to the action. By entering into a Power Purchase Agreement (PPA) with Rocky Mountain Power under the regulations set forth in the Public Utility Regulatory Policies Act (PURPA), the Rawlins Field Office would become a qualifying facility and not be constrained by State of Wyoming regulations prohibiting on-site generation above 25 kW.

Wind Energy Development Program (Instruction Memorandum No. 2009-043) was established by the BLM in 2009 to further support wind energy development on public lands and also to minimize potential environmental and sociocultural impacts. The BLM initiated preparation of a Wind Energy Programmatic EIS in October 2003 and published the Programmatic EIS in June 2005.

Energy Policy Act of 2005 (P.L. 109-58) was signed into law on August 8, 2005. Section 211 of the Act states, “It is the sense of the Congress that the Secretary of the Interior should, before the end of the 10-year period beginning on the date of enactment of this Act, seek to have approved non hydropower renewable energy projects located on the public lands with a generation capacity of at least 10,000 megawatts of electricity.”

1.4.3 Conformance with other Environmental Analyses

- WY-030-05-EA-008 Wind Turbine for The Rawlins BLM Field Office, signed October 25, 2004.
- Record of Decision regarding Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments, signed December 15, 2005.

1.5 Scoping, Public Involvement, and Issues:

1.5.1 Internal scoping and issues:

A site visit was performed on January 14, 2010 to preview the turbine location. During the on-site visit, an alternative location was proposed to the north of the existing turbine in order to reduce possible conflicts with wind turbulence and reduce hazards to health and human safety. Additionally, the alternative location would

result in a smaller footprint for construction purposes, as the turbine laydown would occur within the existing disturbance of the BLM property. This information, along with the project description, as described in section 2.1 was considered during the interdisciplinary review and the development of this EA. Internal BLM interdisciplinary review identified the following issues and resources that will be considered further in this EA.

- Wildlife Resources: Raptor nests have been identified within the town of Rawlins in the past. The town of Rawlins provides nesting substrates and structures not otherwise found in the surrounding landscape, such as large coniferous and deciduous trees, medium sized ornamental shrubs, as well as buildings.
- Cultural Resources: The proposed action is located approximately ¼ mile north of the Wyoming Frontier Prison, a National Register of Historic Places listed property. Other listed properties in the vicinity of the proposed action includes the Rawlins Historic District, the George Ferris Mansion, The France Memorial United Presbyterian Church, the Downtown Rawlins Historic District, and the Union Pacific Depot;
- Recreation Resources: The proposed action is located within the Continental Divide National Scenic Trail SRMA;
- Visual Resources: The proposed action is located within the city limits of Rawlins, Wyoming. How will the proposed turbine be perceived by local residents and users of the immediate area?
- Noise: Will the proposed action produce a higher level of noise than current levels, affecting various users of the immediate area?

The following resources were not identified as issues by the BLM interdisciplinary team but will be discussed further:

- Land Use: The proposed action is located within the city limits of Rawlins, Wyoming. The closest residence is approximately 750 feet from the proposed turbine location, and 1,000 feet from the existing turbine. One occupied building, the old Wyoming National Guard Armory, is located within 150 feet of the existing turbine and approximately 270 feet of the new proposed turbine location;
- Geology and Soils: What are the necessary construction techniques and what affect will they have on users of the immediate area, residences or occupied buildings?

The following resources and issues are either not present or not affected and will not be analyzed further:

Other resource values which are not present or are not affected by the proposed action or alternatives include areas of critical environmental concern (ACEC), threatened and endangered or BLM sensitive species, sage-grouse core areas, wilderness or wilderness study area (WSA), forest resources, livestock grazing, paleontology, special designations and management areas, wild and scenic rivers, transportation and access management, vegetation, wild horse and burro resources, and socioeconomics.

1.5.2 Public involvement:

Letters were sent to the Wyoming Frontier Prison, Carbon County, City of Rawlins, Continental Divide Trail Alliance, Rawlins Certified Local Government, and the Wyoming State Office of State Lands and Investments. These letters notified each party of the proposed action and requested comments. Additionally, an aeronautical study was conducted by the Federal Aviation Administration to determine whether the proposed undertaking would have an effect on air navigation.

On January 27, 2010 a notice was printed in the Rawlins Daily Times regarding the proposal for a new turbine at the RFO. On January 28, 2010 an open house meeting was held at the BLM RFO. Seven members of the public, representing the City of Rawlins, the Wyoming Frontier Prison and personal interests attended. Additionally, on February 11, 2010, the BLM VRM specialist presented the proposal to the Joint Powers Board.

Two comments were received from the public. One individual submitted comments identifying concerns with impacts to the visual quality of the Wyoming Frontier Prison. This issue has been included above. The Carbon County Planning and Development Department replied that they have no objections to the proposed project.

2.0 Proposed Action and Alternatives

2.1 Proposed Action with RFO Standard Operating Procedures and Best Management Practices:

The proposed action is to construct, operate, and decommission a Northwind 100 wind turbine 350 feet north of the existing turbine location. The proposed turbine is a 100 kW solid, tubular tower design (see Appendix 1 for turbine specifications). The proposed wind turbine location is immediately adjacent to the BLM yard (see Diagram 1). Disturbance associated with the construction of the new turbine would be approximately 50 feet by 50 feet, or 2500 square feet. The approximate life of the proposed turbine is 50 years.

The existing lattice tower 20kv turbine would remain in operation at its current location. The existing turbine will continue to operate until it suffers additional maintenance issues that result in it no longer being feasible to retain. Once the existing 20 kv turbine ceases operation, it would be decommissioned and the site reclaimed.

The adjacent BLM yard and access road would be used as a staging and lay-down area for turbine construction. The proposed action would incorporate all Standard Operating Procedures (SOPs), Best Management Practices (BMPs) and mitigation measures as defined in Appendix 2.

The proposed turbine would be connected to the BLM RFO via the existing buried conduit that connects the existing turbine to the BLM office. No additional ground disturbance would be associated with the buried connection. Additionally, the proposed turbine would require a 110 v power supply; this would be provided via the existing conduit. Diagram 1 indicates the locations for all proposed disturbances.

2.3 Alternative 1:

The BLM RFO would authorize the proposed action and remove the existing lattice tower 20kv wind turbine. Reclamation activities would conform with all SOPs and BMPs defined in Appendix 2.

2.2 No Action Alternative:

The BLM would not authorize the proposed action. The existing turbine would remain in place.

2.4 Alternatives Considered But Not Analyzed in Detail:

An alternative was considered to not install a new turbine and to remove the existing turbine. This alternative was considered but eliminated from detailed analysis as it would not meet the purpose and need of the BLM.

3.0 Affected Environment

The project area is on the south-eastern terminus of the Rawlins Uplift, a natural feature which separates the Great Divide Basin to the west from the Hanna Basin to the east. Comprised of varying layers of limestone and sandstone, the uplift causes a downdraft of wind at the proposed location, resulting in a high potential for wind erosion to soils. Consequently soils are shallow in the project area. Geotechnical investigations conducted in March 2010 indicate that soils consist of silty sand, extending to approximately 6 inches in depth. At this point, sandstone bedrock extends to below 13 feet (Terracon, 2010).

Discarded gravel and concrete litters much of the surface in the immediate vicinity of the proposed turbine location. The remainder of the area surrounding the proposed disturbance area consists of shallow loams and sandy loams with varying amounts of exposed bedrock. Vegetation consists of rabbitbrush, low sagebrush, bunch grass, needle and thread grass, bluebunch wheatgrass, prickly pear cactus and numerous forbs. A patch of cheat grass is located west of the proposed location.

The project area is located within the city of Rawlins. The BLM RFO complex, the Wyoming National Guard Armory building, the Wyoming Frontier Prison, local residences, city cemetery, other city infrastructure and the existing BLM lattice tower wind turbine are all visible from the project area. As expected, all of this development creates a highly urbanized environment.



The photo shows the general setting of the proposed location, facing north.

Wildlife habitat in the area has been heavily influenced by human development and occupancy. In spite of the development, wildlife continue to exist in the immediate area. Mammals that are known to inhabit the area include various species of rodent such as mice, ground squirrels, and marmots. Cottontail rabbits and mule deer also frequent the area. The project area is also within moderate to low potential habitat for the Wyoming pocket gopher. However, a site inspection did not reveal any pocket gopher sign. The proposed project is also across the street from the Rawlins Cemetery, and adjacent to Wyoming Frontier Prison grounds. These areas offer a sanctuary of sorts for numerous wildlife species. The cemetery and prison grounds support large cottonwood, aspen, spruce and pine trees. There are many migratory bird species inhabiting these trees. Common bird species include sparrows, house finch, robin, mourning dove, woodpeckers, northern flicker, and raven.

There are not any known bat hibernacula or maternity colonies within proximity to the proposed action. However, there are rock outcrops and cliffs that could provide day roosts for various bat species along the Rawlins uplift.

The Wyoming Frontier Prison, listed in the National Register of Historic Places (NRHP), is located south of the project area. Additional listed properties are located in the vicinity of the project area. In consultation with the Wyoming State Historic Preservation Office (SHPO), a determination was made that the setting of these historic properties has been compromised by previous development within the city of Rawlins.

The Continental Divide National Scenic Trail and the CDNST Special Recreation Management Area (SRMA) traverse immediately adjacent to the existing turbine.

The existing turbine produces approximately 57-58 dB(A) at 100' from the base of the tower. While in operation, the rotation of the blades from the existing turbine is audible when standing nearby or downwind. This noise however does not dominate nor overpower the background noise of passing vehicles from Third Street/US 287.

4.0 Environmental Effects

4.1 Proposed Action

Wildlife: During construction, large, mobile wildlife would be displaced by construction noise and human

presence. Once construction has concluded, these animals would return. Some small, less mobile wildlife would potentially be crushed by vehicles and equipment during construction.

The primary impact to wildlife would occur in the form of migratory bird and, possibly, bat collisions with the existing turbine and the proposed turbine. Data regarding impacts to migratory birds or bats from the existing wind turbine is lacking. It is expected that some bird mortality would occur following collisions with the blades or tower of either turbine. However, it is not expected that the turbines would cause any apparent decline in local abundance of migratory bird species. This is primarily due to the urban setting of the proposed action and the tolerance to human activities and infrastructure exhibited by wildlife that occur in the area. The existing lattice tower turbine has more potential for attracting perching songbirds and raptors than the proposed tubular tower turbine. The addition of another turbine in close proximity to the lattice style tower may increase the chance for collision due to the attractiveness of the lattice style tower and the presence of additional turbine blades on the new turbine. However, since 2006 no birds have been observed using the tower for perching or nest building activity.

The location of the existing turbine and the proposed location for the new turbine are both east of a primary ridge of the uplift that creates wind related updrafts and thermals utilized by migrating birds and foraging raptors. This provides some separation between this local high use bird flyway and the wind turbines and contributes to reduced bird strikes.

In 2008, a great-horned owl built a nest in the cemetery after installation of the existing wind turbine. However, the nest is no longer active and is considered historical. No conclusion can be drawn concerning the inactivity at this nest site.

Implementation of all SOPs and BMPs in Appendix 2 would prevent the need for additional mitigation measures. Mortality surveys would be conducted for at least 1 year following construction of the turbine. Depending on the results of these mortality surveys, it may be necessary to modify the turbine speed, operable time of year, and/or blade color/design in consultation with the US Fish and Wildlife Service and/or Wyoming Game and Fish. The protocol for mortality studies has been included as Appendix 3.

Cultural Resources: A literature review was completed for the project area. A Class III inventory of the project area had previously been conducted. No cultural resources were encountered within the footprint of the proposed project. The historic Wyoming Frontier Prison is situated immediately south of the project area and is the closest historic property to the project area. At the request of the SHPO office, a visual contrast rating was performed to determine the contrast the proposed action would have to the setting of the historic prison. It was determined that the proposed project, as designed, would have a “weak contrast” to the otherwise compromised setting of the listed property. Additional listed properties are located within the vicinity of the project area, primarily within the Rawlins City limits. In consultation with SHPO, a determination of “no adverse effect to historic properties” was made as the setting of these listed properties was determined to be previously compromised by existing modern intrusions. Concurrence was received by the SHPO office on February 25, 2010. The proposed action is not expected to result in significant impacts to cultural resources.

Recreation Resources: The middle country setting of the Continental Divide National Scenic Trail SRMA cannot be met due to the previously existing urban setting and is dominated by human activity and development. The addition of this turbine would not detract from the current overall setting or experience of trail users.

Visual Resources: The existing urban setting dominates the viewshed. The addition of a second turbine would add one more human intrusion that contrasts with the remnant natural view to the west of the project area. The addition of a second turbine of a different design may result in some perception of a lack of uniformity by the residents or visitors to the area. With the implementation of BMPs and mitigation as defined in Appendix 2 (primarily related to turbine coloration), the additional reduction in visual quality of the area would be minimized. A visual contrast rating was conducted as part of the cultural resource evaluation. In consideration of a determination of ‘weak contrast’ and the realization that the project is located in an existing urban environment, it was determined that the additional turbine would not detract greatly from the overall visual

quality of the area.



Visual Simulation of Proposed Action

Noise: The use of heavy equipment during construction would produce increased noise above background levels. This construction noise would not be atypical of construction noise frequently encountered around Rawlins. The increased construction noise would be intermittent and a short term (approximately one month) nuisance and is expected to be negligible beyond the immediate vicinity of the project area. Once operational, the Northwind 100 would produce 55 dB(A) at 130 feet (55 dB(A) being approximately equivalent to normal conversation). The closest public use area or facility to the proposed turbine location would be the Rawlins walking path along Third Street (300 feet east). Users of the walking path would notice only minor increased noise levels comparable to traffic. The proposed turbine is rated as having a slightly lower dB(A) level than the existing turbine. Due to the distance between the existing turbine and the proposed turbine, it is unlikely that the operational noise from one turbine would be perceptible from the other. Background noise from vehicles on the highway would exceed noise levels produced by the turbines. The proposed action would minimally add to the noise levels produced in the area.

Land Use: While the proposed project is located within the city limits of Rawlins, Wyoming, the community has been receptive of renewable energy development projects. City officials have indicated a high level of interest in the BLM developing renewable energy and have approached the BLM to collaborate on community wind projects. A recent city ordinance passed by the city council includes guidelines on residential wind developments.

Geology and Soils: Public users of the area would experience some level of airborne dust during construction.

Implementation of SOPs and BMPs in Appendix 2 would minimize but not eliminate the potential for wind or water erosion of soils around the proposed action. Segregation of topsoil from other spoils, limiting disturbance to the smallest area needed, construction of water bars on steep slopes to reduce run-off, reclamation of disturbed areas within 1 year, removal or containment of construction debris and limiting vehicle traffic to approved routes would reduce dust levels in the vicinity of the project.

Additional Mitigation Measures: Implementation of all SOPs and BMPs in Appendix 2 would prevent the need for additional mitigation measures. No additional mitigation measures have been proposed.

Residual Effects: Since no additional mitigation measures have been proposed, no residual impacts, other than those described above, would occur.

4.2 Alternative 1

Wildlife: This alternative would result in fewer impacts to avian species than the proposed action, as the lattice style turbine would be removed from the site. This would eliminate the artificial perching location thus potentially reducing the overall potential for strikes to birds and/or bats. This alternative would also reduce the potential for accidental avian collisions with the turbine blades due to the removal of one of the turbines.

Cultural Resources: The setting of NRHP eligible properties has been compromised by existing development. The removal of the existing turbine and construction of the proposed turbine at the new project location would not result in any change to the previously compromised setting of NRHP eligible properties..

Recreation Resources: Impacts would be similar to those described for the Proposed Action.

Visual Resources: Impacts would be similar to those described for the Proposed Action.

Noise: Impacts associated with the construction and erection of a Northwind 100 would be similar to those described in the proposed action. However there would be the added temporary noise from construction equipment necessary to remove the existing turbine and foundation.

Land Use: Impacts would be similar to those described for the Proposed Action.

Geology and Soils: Impacts would be similar to those described for the Proposed Action.

Additional Mitigation Measures: Implementation of all SOPs and BMPs in Appendix 2 would prevent the need for additional mitigation measures. No additional mitigation measures have been proposed.

Residual Effects: Since no additional mitigation measures have been proposed, no residual impacts, other than those described above, would occur.



Visual Simulation of Alternative 1

4.3 No Action Alternative

Resources and uses would continue as they presently exist. The associated impacts of the No Action Alternative have already been analyzed in WY-030-05-EA-008 Wind Turbine for The Rawlins BLM Field Office, signed October 25, 2004.

Cumulative Effects: There are currently private residences, improved roads and business and community buildings in the vicinity of the area of the proposed project. The proposed action would add slightly to the developed nature of the area. Cumulative impacts from the proposed action are considered minor.

5.0 Agencies and Persons Consulted

Name	Title	Agency/Organization
Bonni Bruce	Archaeologist	BLM
Rhen Etzelmiller	Wildlife Biologist	BLM
Brenda Woods	Realty Specialist	BLM
Brian R Smith	Recreation Specialist	BLM
Andy Skordas	Civil Engineer	BLM
John Spehar	Planning & Environmental Coordinator	BLM

Document Author

Date

Appendix 1: Northwind 100 General Specifications



Northwind[®] 100 Wind Turbine General Specifications

A01465 Rev D

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1 Introduction

This document presents key specifications for the Northwind[®] 100 wind turbine with a 21 meter rotor and 37 meter tower. Specifications for the Northwind 100 are provided in Table 1, with certain details deferred to the appropriate section(s) of this document. Where applicable, alternative specifications are given for the Northwind 100 Arctic wind turbine.

Table 1 Northwind 100 General Information

General Configuration	
Model	Northwind [®] 100
Design Class	IEC WTGS IIA ¹ (Standard Turbine 50/60 Hz) IEC WTGS S (Arctic Turbine)
Drive Train	Direct drive (gearless architecture)
Generator Type	Permanent magnet - synchronous
Power Regulation	Variable speed; stall control
Orientation	Upwind
Yaw Control	Active
Number of Blades	3
Rotor Diameter	21 meters (69 feet)
Performance	
Rated Electrical Power at standard conditions	100 kW
Approximate Rotor Speed	60 RPM
Cut-in Wind Speed	3.5 meters/second (7.8 miles/hour)
Rated Wind Speed	15 meters/second (34 miles/hour)
Cut-out Wind Speed	25 meters/second (56 miles/hour)
Noise	55 dBA at 40 meters (55 dBA at 130 feet)
Control System	
Controller Type	DSP-based multi-processor embedded platform
Monitoring System	SmartView [®] Monitoring System

¹ International Electrotechnical Commission Wind Turbine Generating System, 61400-1 ed2

Safety System	Designed to IEC 61400-1 ed2, redundant braking	
Communications Protocol	ModbusTCP	
Tower System		
Approximate Hub Height	37 meters (120 feet)	
Tower Configuration	3 section tubular monopole, nested for shipping	
Approvals and Conformity	60 Hz Turbines (Approved to)	50 Hz Turbines (Conformance with)
	UL 1741 UL 1004-4 CSA C22.2 107.1-01 CSA C22.2 100-04	EN 60204-1 EN 12100-1, 2 EN 6100-6-2:2005 EN 6100-6-4:2007N
Unit Mass		
Nacelle and Rotor Mass	7,200 kilograms (15,900 pounds)	
Tower Mass	14,000 kilograms (30,900 pounds)	
Standard Conditions	60 Hz Turbines	50 Hz Turbines
Elevation	Sea Level	
Air Temperature	15 degrees Celsius (59 degrees Fahrenheit)	
Air Density	1.225 kilograms per cubic meter (Specific Volume: 13.08 cubic feet per pound)	
Class S Conditions (Arctic Turbine)	60 Hz Turbines	50 Hz Turbines
Elevation	Sea Level	
Air Temperature	-10 degrees Celsius (14 degrees Fahrenheit)	
Air Density	1.34 kilograms per cubic meter (Specific Volume: 11.95 cubic feet per pound)	

2 Environmental Specifications

This section provides the environment specifications for the Northwind 100 turbine.

Table 2 Ambient Turbine Conditions

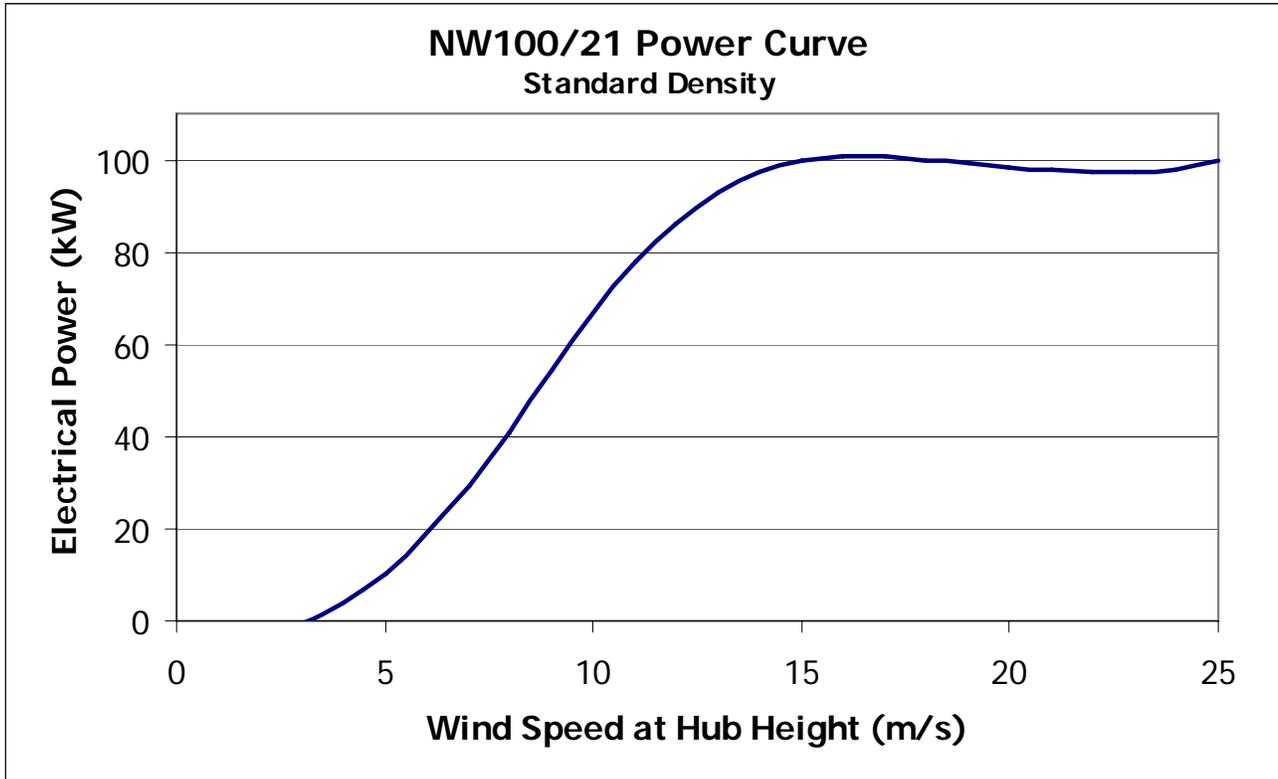
	Standard Turbine	Arctic Turbine
Operational	-20°C to 50°C (-4 °F to 122°F)	-40 °C to 50°C (-40 °F to 122°F)
Storage	-40°C to 55°C (-40 °F to 131°F)	-40°C to 55°C (-40 °F to 131°F)
Maximum Elevation	1,000 meters above sea level	1,000 meters above sea level

Table 3 IEC WTGS² Conditions

Parameter	Class IIA	Class S (Arctic Turbine)
Annual Average Wind Speed at hub height, V_{avg} (maximum annual average)	8.5 meters/second (19 miles/hour)	8.3 meters/second (18.5 miles/hour)
Reference Wind Speed at hub height, V_{ref} (10-minute average)	42.5 meters/second (95 miles/hour)	40.6 meters/second (90.5 miles/hour)
Extreme Wind Speed at hub height (3-second gust, 50-year recurrence period) V_{e50}	59.5 meters/second (133 miles/hour)	56.0 meters/second (125 miles/hour)
Characteristic turbulence intensity at 15 m/s, I_{15}	0.18 (defined by IEC 61400-1 ed2)	0.18 (defined by IEC 61400-1 ed2)
Design lifetime	20 years	20 years

² International Electrotechnical Commission Wind Turbine Generating System, 61400-1 ed2

3 Power Curve and Energy Production



Power Curve Data				
Vm (m/s)	Power (kWe)		Vm (m/s)	Power (kWe)
			14	97.3
			15	100.0
4	3.7		16	100.8
5	10.5		17	100.6
6	19.0		18	99.8
7	29.4		19	99.4
8	41.0		20	98.6
9	54.3		21	97.8
10	66.8		22	97.3
11	77.7		23	97.3
12	86.4		24	98.0
13	92.8		25	99.7

Annual Energy Production	
Annual Average Wind Speed (m/s)	Annual Output (kWh)
4.0	77,000
4.5	110,000
5.0	145,000
5.5	183,000
6.0	222,000
6.5	260,000
7.0	298,000
7.5	334,000
8.0	368,000
8.5	400,000
Rayleigh Distribution	

The annual energy production shown is calculated at standard conditions with a 100% availability factor.

4 Electrical Specifications

4.1 Section Overview

This section defines the electrical specifications for the Northwind 100 wind turbine. Northwind 100 wind turbine scope of supply includes turbine equipment up to and including the fused disconnect and junction box located at the bottom of the tower. Specifications herein refer to turbine output at the base of the tower.

4.2 Turbine Output Specifications

These specifications refer to the base of the tower and the fused disconnect

Table 4 Northwind 100 Output Specifications

	60 Hz Turbines	50 Hz Turbines
3-Phase Output Voltage	480 VAC (+/-10%)	
Nominal Active Power Output	100 kW	
Maximum Reactive Power	+/-45 kVAR	

5 Disclaimers and Reservations

Weather and altitude beyond standard conditions may affect system performance. High turbulence can reduce system performance.

The turbine controls may safely stop operation or delay startup when ambient conditions appear to be within specification. Various safety, environmental and situational variables will cause the turbine's control system to behave this way.

Following periods of grid outage and/or extended low temperatures, a time allowance for warm-up must be expected; the time will vary based on ambient conditions and the duration of the conditions.

A variety of conditions can affect turbine performance, including but not limited to maintenance, site conditions, climatic conditions and electrical grid conditions. These general specifications do not guarantee performance or operability at a particular site.

The Northwind 100 Arctic wind turbine includes additional heaters, which may increase parasitic load at lower ambient temperatures.

Turbines may be installed in coastal environments, but should not be subjected to sea spray. The lifetime maintenance costs of a turbine will vary based on site conditions, including wind, precipitation, temperature, and corrosivity of the air. Corrosivity of the air varies based on the local atmospheric conditions at the site including time of wetness, acidity, and salinity.

The values stated in metric (SI) units shall be regarded as the standard. The inch-pound (IP) units shown in parenthesis shall be for reference only. Northern is continually developing product upgrades, modifications and improvements, and as a result reserves the right to change or alter these specifications at any time.

Appendix 2: SOPs and BMPs

These Standard Operating Procedures (SOPs) and Best Management Practices (BMPs) are necessary to comply with, as applicable, the Federal Land Policy and Management Act of 1976 (FLPMA), the Mineral Leasing Act of 1920, the Rawlins Resource Management Plan (December 24, 2008), and other laws, regulations, and policy. Exceptions to the SOPs and BMPs would be submitted in writing and would be considered on a case-by-case basis; decisions would be based on effects to resources.

1.0 All Project Phases:

- 1.1 All survey monuments within and adjacent to the project area would be protected. Disturbed monuments would be restored, by a qualified surveyor, to satisfactory condition as specified by the agency to which the monument/s belong/s.
- 1.2 Cultural resources discovered during construction or any other project phase would be protected and construction activities in the immediate area would be suspended. The discovery would be reported to the BLM immediately. Construction would commence only after the discovery is evaluated and additional clearance is received from the BLM.
- 1.3 Paleontological resources, either large or conspicuous and/or of significant scientific value, which are discovered at any time during construction, operations, or termination of the project would be reported to the BLM immediately. Construction activities within 250 feet of such finds would be suspended. Construction activity would resume only after the find is evaluated by the BLM and authorization is granted.
- 1.4 Weeds would be controlled on project disturbed areas and natives lands infested as a direct result of the project.
- 1.5 During conditions of extreme fire danger, surface use operations may either be limited or suspended in specific areas or additional fire prevention measures may be required as needed.
- 1.6 The project would be monitored annually, for the first five years after construction, for the presence of noxious and invasive weeds. The project would also be monitored annually, for the first five years after construction, to evaluate reclamation success. Thereafter, the project would be monitored at least once every three years, for the life of the project, to identify infestations of noxious and invasive weeds.
- 1.7 Construction and maintenance activities would not be performed when wet conditions cause vehicles and equipment to create ruts in excess of four inches deep.
- 1.8 All activities associated with the construction, operation, and termination of the project would be conducted only within the authorized area.
- 1.9 All vehicles would use only authorized travel routes and would not use any other access route, such as two-track roads, trails, and pipeline rights-of-way to access the project area.
- 1.10 Toxic substances would be handled in a manner which complies with appropriate laws and regulations. Spills would be reported as required by appropriate laws and regulations.
- 1.11 Federal, State, and local emission standards for air quality will be met.
- 1.12 A litter policing program would be implemented along all roads and sites associated with the project.
- 1.13 Accumulated snow present on the ground at the outset of construction, maintenance, or reclamation activities would be removed before the soil is disturbed and piled downhill from the disturbed area. Equipment used for any non-construction snow removal operations would be equipped with 6 inch shoes to ensure blades do not remove topsoil or vegetation. Special precautions would be taken where the surface of the ground is uneven and at drainage crossings to ensure that equipment blades do not destroy vegetation
- 1.14 Emissions of particulate matter from the project and ancillary facilities during construction, operation, and reclamation activities would be minimized by application of water or other dust suppressants. Dust inhibitors

(surfacing materials, dust suppressants, and water) would be used as necessary on locations that present a fugitive dust problem.

- 1.15 All design, material, and construction, operation, maintenance, and termination practices would be in accordance with safe and proven engineering practices.
- 1.16 Prior to termination of the project, the reclamation plan will be reviewed for adequacy. A new or updated plan may be required as applicable.

2.0 All Construction Activities:

- 2.1 Excavation would be limited to the areas of construction. No borrow areas for fill material would be permitted on the site. All off-site borrow areas would be approved in writing by the BLM in advance of excavation. All waste material resulting from construction or use of the site would be removed from the site.
- 2.2 Excavation of the turbine pad would require heavy duty equipment and ripping or jack-hammering to facilitate breakup of cemented soil. Blasting activities would not be allowed.
- 2.3 Current accumulations of concrete slag located on site would be disposed of properly.
- 2.4 Construction-related traffic would be restricted to approved routes. New access roads or cross-country vehicle travel would not be permitted unless specifically authorized.
- 2.5 All removed topsoil available from construction locations, including cut and fill, would be clearly segregated from all spoil for use during reclamation activities.
- 2.6 Drainage and runoff would be diverted away from all new construction. All drainage structures would simulate topographic contour lines, have a grade no greater than .5 - 1 percent, and would release water onto undisturbed ground without causing additional and/or accelerated erosion.
- 2.7 Construction sites would be maintained in a sanitary condition at all times; waste materials at those sites would be disposed of promptly at an appropriate waste disposal site. "Waste" would mean all discarded matter including, but not limited to, human waste, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment.
- 2.8 Construction activities will be coordinated with activities at the National Guard Armory to avoid activity disruption if noise is excessive.
- 2.9 The centerline and/or exterior limits of the project area would be surveyed and clearly marked so equipment operators stay within the approved project area.
- 2.10 Construction holes left open over night would be covered. Covers would be secured in place and would be strong enough to prevent wildlife from falling through and into a hole.
- 2.11 Public safety will be provided for within and adjacent to the project area. This may include, but would not be limited to barricades for open trenches, and/or flagmen/women with communication systems for single-lane roads without intervisible turnouts.

3.0 All Operations Activities:

- 3.1 Except where a road is expressly authorized to remain after construction is complete, the project area would not be used as a road except for routine maintenance.
- 3.2 To reduce the potential impacts to migratory birds UV paint would be used on the turbine hub and blades. Most migratory birds see in the UV spectrum of light and therefore could potentially avoid the fan blades more easily.
- 3.3 The turbine cut in speed will be set at 6 meters/second during critical migration periods. This will avoid the primary flight wind speeds for bats and birds.
- 3.4 In conformance with Federal Aviation Administration (FAA) requirements, the turbine shall be marked and/or lighted in accordance with FAA Advisor circular 70/7460-1 K Change 2, Obstruction marking and Lighting, a

med-dual system. The lighting will consist of a single flashing red light at nighttime and a flashing white light during daylight.

- 3.5 For health and safety, the turbine tower will be locked so no one can enter the turbine.
- 3.6 The wind turbine itself shall be painted with a thirty percent grey scale.
- 3.7 All above-ground structures not including the wind turbine, not subject to safety requirements would be painted by the Holder to blend with the natural color of the landscape. The paint used would be a color which simulates "Standard Environmental Colors." Unless otherwise specified, above ground structures would be painted **Shale Green** (5Y 4/2).

4.0 All Reclamation Activities:

- 4.1 Interim or final reclamation of all surface disturbed areas would commence and be complete within one year of the initial disturbance. Only areas needed for continual use and that are approved by the BLM would not be reclaimed until they are no longer in use.
- 4.2 Reclamation earthwork would consist, as applicable, of the measures outlined in the reclamation plan (Appendix 4).
- 4.3 Upon decommissioning, the area of the turbine would be reclaimed to preexisting conditions, including removal of the concrete pad and disposal of all components in an approved facility.

5.0 Wildlife Resources

- 5.1 If any dead or injured threatened, endangered, proposed, or candidate animal species are located during construction or operation, the U.S. Fish and Wildlife Service's Wyoming Field Office (307-772-2374), their law enforcement office (307-261-6365), and the BLM Rawlins Field Office (307-328-4200) would be notified within 24 hours. If any dead or injured sensitive species is located during construction or operation, the BLM Rawlins Field Office would also be notified within 24 hours.
- 5.2 Mortality surveys will be conducted for at least 1 year following construction of the tower. Depending on the results of these mortality surveys, it may be necessary to change the cut in speeds, operable time of year, and/or blade color/design in the future. The protocol for mortality studies has been included as Appendix 3.

Appendix 3: Avian Mortality Transects Methodology

130 meter x 130 meter plots should be established centered on the meteorological tower

10 meter wide walking transects (search 5 meters either side of transect line) within plot

- 13 transects = 1390 meters or about 1 mile (start in 5 meters from edge)

Conduct transects at two-week intervals

Data Collection

- Species
- Date
- Time
- Location
 - Map in 130/130 plot area/GPS Coordinates (UTMs, NAD83)
- Condition
 - Intact
 - Scavenged
 - Feathers (enough to indicate mortality)
- Comments
- Photograph

Remove carcass from plot area

Appendix 4: RFO Wind Turbine Reclamation Plan Template

1.0 Pre-Disturbance Site Characterization

- Based on auger testing, soils general consist of approximately six inches of silty sand with vegetation. Below the topsoil and extending to the maximum depth of exploration of 13 feet consists of sandstone bedrock. Auger refusal was encountered within the sandstone bedrock.
- The location is highly disturbed with industrial zoned conditions. On site vegetation consists of some native species, but many non-native materials including concrete slag are present on the surface.
- The area does meet the Wyoming BLM Reclamation Policy (BLM WY IM 2009-022) definition for having limited reclamation potential as soils are extremely shallow with bedrock encountered at six inches below ground surface. While some native species are present on site, the potential for successful reclamation is low.
- The project area is on the southwestern terminus of the Rawlins Uplift, a natural feature which separates the Great Divide Basin to the west from the Hanna Basin to the east. Comprised of varying layers of limestone and sandstone, the uplift causes a downdraft of wind at the proposed location, resulting in a high potential of wind erosion to soils. Consequently soils are shallow in the project area. Geotechnical investigations conducted in March 2010 indicate that soils consist of silty sand, extending to approximately 6 inches in depth. At this point, sandstone bedrock extends to below 13 feet (Terracon, 2010).
- Gravel and rip rap covers much of the surface in the immediate vicinity of the turbine location. The remainder of the area surrounding the proposed disturbance area consists of shallow loams and sandy loams with varying amounts of exposed bedrock. Vegetation consists of rabbitbrush, low sagebrush, bunch grass, needle and thread grass, blue bunch wheat grass, prickly pear cactus and various forbs. A patch of cheat grass is located west of the disturbance area.

2.0 Surface Disturbing Activities

- All waste materials will be managed in accordance with reclamation requirement #1 From WY IM-2009-022.
 - All contaminated soil materials will be segregated, treated, and/or bio-remediated
 - Only authorized waste materials will be buried on site. Buried material will be covered with a minimum of three feet of suitable material or meet other program standards.
 - All waste materials moved off-site will be transported to an authorized disposal facility.
- Augering did not encounter any groundwater to a depth of 13 feet below surface. The potential for groundwater contamination is non-existent.
- Slope stability, surface stability, and desired topographic diversity will be re-established in accordance with reclamation requirement #3 From WY IM-2009-022.
- The potential for sheet and rill erosion on/or adjacent to the reclaimed area is low based upon the shallow soils. However, the area will be monitored and any evidence of erosion will be immediately addressed.

- Topsoil (if any) will be segregated to maintain the biological, chemical, and physical integrity (where appropriate) in accordance with reclamation requirement #5 From WY IM-2009-022.

3.0 Site Preparation and Seeding

- The site will be properly prepared for revegetation (Reclamation Requirement #6 From WY IM-2009-022) through the following steps:
 - Soil materials will be redistributed in a manner similar to the original vertical profile.
 - Reclamation earthwork would consist, as applicable, of:
 - a) backfilling pits,
 - b) re-contouring and stabilizing the project area, access road, drainage channels, utility and pipeline corridors, and all other disturbed areas, to approximately the original contour, shape, and configuration that existed before construction (any compacted backfilling activities shall ensure proper settling and stabilization),
 - c) surface ripping, prior to topsoil placement, to a depth of 18-24 inches deep on 18-24 inch centers to reduce compaction,
 - d) final grading and replacement of all topsoil so that no topsoil remains in the stockpile,
 - e) surface-roughening and other techniques such as snow fencing to increase soil moisture retention and reduce compaction (all surface soil material would be pitted or roughened such that the entire reclamation area would be uniformly covered with depressions constructed perpendicular to the natural flow of water and/or prevailing wind), seeding in accordance with reclamation portions of the project description.
- Suitable surface and subsurface physical, chemical, and biological properties will be provided to support the long term establishment and viability of the desired plant community.
- Seed and seedling establishment will be protected (e.g. erosion control matting, mulching, hydro-seeding, surface roughening, fencing, targeted fertilization, netting, geotextiles, and watering as appropriate).
- Reseeding will be conducted prior to the first growing season after completion of construction activities. Reseeding will include establishment of a desired self-perpetuating native plant community (Reclamation Requirement #7 From WY IM-2009-022). Within 30 days of completion of construction activities, the BLM will work closely with the contractor to determine the most appropriate seed mix to compliment the diversity of vegetation currently on site.
- Interseeding, secondary seeding, or staggered seeding may be required to accomplish re-vegetation objectives. The seed mixture/s would be planted in the amounts specified in pounds of pure live seed (PLS) per acre. There would be no primary or secondary noxious weed seed in the seed mixture. Seed would be tested; viability testing of seed would be done in accordance with State law(s) and within two months prior to purchase. Commercial seed would be either certified or registered seed.
- Seed would be planted using a drill equipped with a depth regulator to ensure proper depth of planting where drilling is possible. The seed mixture would be evenly and uniformly planted over the disturbed area. Smaller/heavier seeds have a tendency to drop to the bottom of the drill and are planted first, so person operating the seed drill would take appropriate measures to ensure this does not occur. Where drilling is not possible, seed would be broadcast and the area raked or chained to cover the seed. When broadcasting the seed, the pounds per acre noted below would be doubled. The seeding would be repeated until a satisfactory stand is established. Evaluation of growth would not be made before completion of the first growing season after seeding.

4.0 Manage Invasive Species (Reclamation Requirement #9 From WY IM-2009-022)

- A current stand of cheat grass is located approximately 150 feet west of the proposed development activity. Additionally, individual stands of crested wheat grass are found throughout the immediate vicinity.

- Weed management on site will be coordinated through the BLM Rawlins Field Office Weed Management specialist, in accordance with state and county requirements. Due to the presence of invasive species adjacent to the proposed project, the area will be closely monitored to ensure activities do not result in proliferation of invasive species.

5.0 Monitoring Plan (Reclamation Requirement #10 From WY IM-2009-022)

- Compliance and effectiveness monitoring will be conducted in accordance with a BLM and State approved monitoring protocol and with the following in mind:
 - Soil erosion/movement
 - Vegetation: density, diversity (species composition), vigor
 - Weeds: density, species composition
 - Photo reference points
 - Compliance with reclamation plan
 - Documenting/monitoring protocols
 - Sites proposed for the end of monitoring (i.e. sites that were successfully reclaimed)
 - Geospatial file(s) or geographic information system (GIS) layer(s)