



Federal Aviation Administration
 Great Lakes Regional Office
 2300 East Devon Avenue-AGL-520
 Des Plaines, IL 60018

Aeronautical Study No.
 2005-AGL-4127-OE

Issued Date: 07/26/2005

Joe Marchese
 FPL Energy - Burleigh County Wind, LLC.
 700 Universe Blvd.
 Juno Beach, FL 33408-2683

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has completed an aeronautical study under the provisions of 49 U.S.C., Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure Type:	Wind Turbine	PROJECT # # 30
Location:	Wilton, ND	
Latitude:	47-6-40.31 NAD 83	
Longitude:	100-43-48.26	
Heights:	389 feet above ground level (AGL) 2539 feet above mean sea level (AMSL)	

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked and/or lighted in accordance with FAA Advisory Circular 70/7460-1 K Chg 1, Obstruction Marking and Lighting, red lights - Chapters 4,5 (Red), & 12.

It is required that the enclosed FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

At least 10 days prior to start of construction
 (7460-2, Part I)

Within 5 days after the construction reaches its greatest height
 (7460-2, Part II)

As a result of this structure being critical to flight safety, it is required that the FAA be kept apprised as to the status of the project. Failure to respond to periodic FAA inquiries could invalidate this determination.

See attachment for additional condition(s) or information.

This determination expires on 01/26/2007 unless:

- (a) extended, revised or terminated by the issuing office.
- (b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE

EXPIRATION DATE.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Communications Commission if the structure is subject to their licensing authority.

If we can be of further assistance, please contact our office at (847)294 7575. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2005-AGL-4127-OE.

Signature Control No: 427993-393456

(DNE)

Fred Souchet
Specialist

Attachment(s)
Additional Information

7460-2 Attached



Federal Aviation Administration
 Great Lakes Regional Office
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 Des Plaines, IL 60018

Aeronautical Study No.
 2005-AGL-4128-OE

Issued Date: 07/26/2005

Joe Marchese
 FPL Energy - Burleigh County Wind, LLC.
 700 Universe Blvd.
 Juno Beach, FL 33408-2683

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has completed an aeronautical study under the provisions of 49 U.S.C., Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure Type: Wind Turbine
 Location: Wilton, ND
 Latitude: 47-6-24.06 NAD 83
 Longitude: 100-43-36.13
 Heights: 389 feet above ground level (AGL)
 2557 feet above mean sea level (AMSL)

PROJECT #
 # 31

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked and/or lighted in accordance with FAA Advisory Circular 70/7460-1 K Chg 1, Obstruction Marking and Lighting, red lights - Chapters 4,5(Red), &12.

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 (7460-2, Part I)

Within 5 days after the construction reaches its greatest height
 (7460-2, Part II)

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If we can be of further assistance, please contact our office at (847)294 7575. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2005-AGL-4128-OE.

Signature Control No: 427994-393455

(DNE)

Fred Souchet
Specialist

Attachment(s)
Additional Information

7460-2 Attached



Federal Aviation Administration
 Great Lakes Regional Office
 2300 East Devon Avenue-AGL-520
 Des Plaines, IL 60018

Aeronautical Study No.
 2005-AGL-4138-OE

Issued Date: 07/26/2005

Joe Marchese
 FPL Energy - Burleigh County Wind, LLC.
 700 Universe Blvd.
 Juno Beach, FL 33408-2683

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has completed an aeronautical study under the provisions of 49 U.S.C., Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure Type: Wind Turbine
 Location: Wilton, ND
 Latitude: 47-6-24.14 NAD 83
 Longitude: 100-43-23.69
 Heights: 389 feet above ground level (AGL)
 2552 feet above mean sea level (AMSL)

PROJECT #
 32

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked and/or lighted in accordance with FAA Advisory Circular 70/7460-1 K Chg 1, Obstruction Marking and Lighting, marked - Chapters 3 & 12.

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 (7460-2, Part I)

Within 5 days after the construction reaches its greatest height
 (7460-2, Part II)

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If we can be of further assistance, please contact our office at (847)294 7575. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2005-AGL-4138-OE.

Signature Control No: 428006-393410

(DNE)

Fred Souchet
Specialist

Attachment(s)
Additional Information

7460-2 Attached



Federal Aviation Administration
 Great Lakes Regional Office
 2300 East Devon Avenue-AGL-520
 Des Plaines, IL 60018

Aeronautical Study No.
 2005-AGL-4129-OE

Issued Date: 07/26/2005

Joe Marchese
 FPL Energy - Burleigh County Wind, LLC.
 700 Universe Blvd.
 Juno Beach, FL 33408-2683

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has completed an aeronautical study under the provisions of 49 U.S.C., Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure Type:	Wind Turbine	PROJECT # # 33
Location:	Wilton, ND	
Latitude:	47-6-24.13 NAD 83	
Longitude:	100-43-8.83	
Heights:	389 feet above ground level (AGL) 2567 feet above mean sea level (AMSL)	

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

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 (7460-2, Part I)

Within 5 days after the construction reaches its greatest height
 (7460-2, Part II)

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Signature Control No: 427995-393453

(DNE)

Fred Souchet
Specialist

Attachment(s)
Additional Information

7460-2 Attached



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 Des Plaines, IL 60018

Aeronautical Study No.
 2005-AGL-4139-OE

Issued Date: 07/26/2005

Joe Marchese
 FPL Energy - Burleigh County Wind, LLC.
 700 Universe Blvd.
 Juno Beach, FL 33408-2683

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has completed an aeronautical study under the provisions of 49 U.S.C., Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerning: **PROJECT #**

Structure Type: Wind Turbine
 Location: Wilton, ND
 Latitude: 47-7-20.36 NAD 83
 Longitude: 100-44-46.96
 Heights: 389 feet above ground level (AGL)
 2530 feet above mean sea level (AMSL)

Alt 1

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

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Within 5 days after the construction reaches its greatest height
 (7460-2, Part II)

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Signature Control No: 428007-393408

(DNE)

Fred Souchet
Specialist

Attachment(s)
Additional Information

7460-2 Attached



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 Des Plaines, IL 60018

Aeronautical Study No.
 2005-AGL-4140-OE

Issued Date: 07/26/2005

Joe Marchese
 FPL Energy - Burleigh County Wind, LLC.
 700 Universe Blvd.
 Juno Beach, FL 33408-2683

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Structure Type: Wind Turbine
 Location: Wilton, ND
 Latitude: 47-7-20.36 NAD 83
 Longitude: 100-44-37.57
 Heights: 389 feet above ground level (AGL)
 2540 feet above mean sea level (AMSL)

Alt 2

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

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Signature Control No: 428008-393403

(DNE)

Fred Souchet
Specialist

Attachment(s)
Additional Information

7460-2 Attached



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 Great Lakes Regional Office
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Aeronautical Study No.
 2005-AGL-4141-OE

Issued Date: 07/26/2005

Joe Marchese
 FPL Energy - Burleigh County Wind, LLC.
 700 Universe Blvd.
 Juno Beach, FL 33408-2683

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Structure Type: Wind Turbine
 Location: Wilton, ND
 Latitude: 47-7-27.03 NAD 83
 Longitude: 100-44-24.72
 Heights: 389 feet above ground level (AGL)
 2549 feet above mean sea level (AMSL)

A14 3

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

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Signature Control No: 428009-393402

(DNE)

Fred Souchet
Specialist

Attachment(s)
Additional Information

7460-2 Attached

CHAPTER 1

INTRODUCTION

The Burleigh County Wind Energy Center is a wind generation project proposed by FPL Energy Burleigh County Wind, LLC (Burleigh County Wind). The proposed project would produce up to 50 megawatts (MW) of electricity, averaged annually. The proposed project is located in Burleigh County, North Dakota, approximately 3 miles south and 2 miles east of the town of Wilton, North Dakota (Figures 1-1 and 1-2).

Central Power Electric Cooperative (Central Power), a member of the Basin Electric Power Cooperative (Basin), would construct a new 230-kilovolt (kV) transmission line, approximately 4.4 miles long, to connect the proposed Wind Energy Center to a U.S. Department of Energy (DOE) Western Area Power Administration (Western) transmission line, called the Garrison-Bismarck 230-kV Transmission Line. The interconnection with Western's transmission line would require modifications to the existing Western facility, including construction of a temporary interconnection called a "tap" and a permanent switching station. The project is scheduled to be operational by the end of 2005. Electricity produced from the project is expected to meet the energy demands of approximately 30,000 North Dakota households.

The project is a Federal action under the National Environmental Policy Act (NEPA), Section 102(2) (1969), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), DOE NEPA Implementing Procedures (10 CFR Part 1021), and other applicable regulations. Western prepared this environmental assessment (EA) under these regulations to describe the analysis of environmental effects of the proposed project (proposed action) and alternatives, including the no-action alternative.

PURPOSE OF AND NEED FOR ACTION

The DOE Energy Information Administration (DOE-EIA) is forecasting a 1.8 percent annual growth in electricity sales through 2020. This growth will require an increase in generating capacity of up to 1,300 new power plants over the next 20 years (DOE-EIA 2001). Deregulation of the electric industry and current energy supply issues have emphasized the need for new and diverse energy sources in the region.

APPLICANTS' UNDERLYING NEED

Project proponents need to provide additional network resources to meet load obligations and support renewable resources.

Basin needs to meet a recent shareholder directive to diversify its current generation portfolio, which includes coal, hydroelectric, and gas with an economical renewable energy source.

Burleigh County Wind and Central Power need to develop, operate, and maintain the generation and transmission infrastructure.

AGENCY PURPOSE AND NEED

Basin has a Network Integration Service Agreement under Western's Open Access Transmission Tariff (Tariff) and applied to interconnect a new Designated Network Resource to Western's existing Garrison-Bismarck 230-kV Transmission Line. Western is required pursuant to the terms of its Tariff to respond to Basin's request and, in responding to the need for agency action, has the following purposes:

- Western offers capacity on its transmission system to deliver electricity when such capacity is available, under Western's Tariff. The Tariff has been approved by the Federal Energy Regulatory Commission (FERC) as being consistent with the Commission's Final Order Nos. 888, 888A, 888B, and 888C, which are intended to ensure non-discriminatory transmission system access. Pursuant to the Commission's Order Nos. 2003, 2003-A and 2003-B, Western submitted revisions to its non-jurisdictional Tariff on January 25, 2005, to the Commission. The purpose of the filing was to revise certain terms of Western's original Tariff and to incorporate the Large Generator Interconnection Procedures and a Large Generator Interconnection Agreement which are applicable to the 100MW interconnection request from Basin. FERC conditionally approved Western's Tariff revisions on July 6, 2005. Western needs to respond to the interconnection and transmission service requests under the provisions of its revised Tariff.
- Western is required to ensure protection of transmission system reliability and service to existing customers. Western's purpose is to ensure that existing reliability and service is not degraded. Western's LGIP provides for transmission and system studies to ensure that system reliability and service to existing customers is not adversely affected.

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Page intentionally left blank – Figure 1-2

➤ Page intentionally left blank – Figure 1-2 (back)

The Applicant's objectives must be considered. Because the statement of purpose and need affects the extent to which alternatives are considered reasonable, it is important to understand both the agency's purpose and need and that of the applicant.

AUTHORIZING ACTIONS

Federal, state, and local agencies, including Western, have jurisdiction over certain aspects of the proposed action. Table 1-1 provides a listing of agencies and their respective permit/authorizing responsibilities with respect to the proposed Burleigh County Wind Energy Center.

AGENCY CONSULTATION AND PUBLIC PARTICIPATION

Western has consulted with the various state and Federal agencies and Tribes (listed in Chapter 4 of this document) in the development of this analysis. In addition, Western will consider comments to this EA from agencies, tribes, landowners, and other interested parties.

**TABLE 1-1
Permit/Authorizing Responsibilities**

Authorizing Action/Statute	Responsible Agency
Interconnection/Transmission Service Agreement	Western
230-kV Transmission Line Construction	North Dakota Public Service Commission
Utility Occupancy Agreement	North Dakota Department of Transportation (NDDOT)
Easement Grants and Road Crossing Permits	NDDOT, Ecklund Township Board
Review and Approval of Weed Control Plan	Burleigh County, Ecklund Township Board
National Environmental Policy Act	Western
National Historic Preservation Act	Western, North Dakota State Historical Preservation Office (NDSHPO)
Native American Graves Protection and Repatriation Act	Western
American Indian Religious Freedom Act	Western
Construction Storm Water Permit	North Dakota Department of Health (NDDoH), North Dakota Division of Water Quality, Storm Water Program
Clean Water Act Compliance	U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service (USFWS)
Safety Plan	North Dakota Occupational Safety and Health Administration
Migratory Bird Treaty Act	USFWS, Western
Endangered Species Act	USFWS, Western
Tower Lighting	Federal Aviation Administration (FAA)

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

Burleigh County Wind proposes to construct, own, and operate a wind energy center in Burleigh County, North Dakota. The Burleigh County Wind Energy Center (Wind Energy Center) would consist of no more than 66 wind turbines (33 initially as part of phase I, and up to an additional 33 in phase II) with an output of up to 50 MW, averaged annually. Central Power proposes to construct, own, and operate approximately 4.4 miles of 230-kV transmission line and associated structures, equipment, and facilities as part of the first phase of development. The transmission line would originate at the proposed Burleigh County Wind collection substation and continue west to interconnect with Western's existing Garrison-Bismarck 230-kV Transmission Line.

PROPOSED ACTION

The proposed Burleigh County Wind Energy Project (Proposed Action) is located near the rural communities of Wilton and Regan in central North Dakota, approximately 18 miles north of Bismarck, North Dakota (Figure 2-1). The Proposed Action would consist of the following components:

- Access roads;
- Thirty-three 1.5-MW General Electric (GE) turbines as part of the initial development;
- Thirty-three additional turbines as part of the expanded project;
- Collection transmission lines;
- A collection substation at the Wind Energy Center;
- A 230-kV high voltage transmission line from the collection substation to the point of interconnection with Western's existing Garrison-Bismarck 230-kV Transmission Line;
- A temporary interconnection facility ("tap") at the point of interconnection with Western's existing Garrison-Bismarck 230-kV Transmission Line; and,

- A new permanent switching station at the point of interconnection with Western's existing Garrison-Bismarck 230-kV Transmission Line.

All facilities would be constructed in accordance with the National Electrical Safety Code, U.S. Department of Labor Occupational Safety and Health Standards, and *Central's Power System Safety Manual* for maximum safety and property protection. The following sections describe these project components, pre-construction planning, and construction activities associated with each.

PRECONSTRUCTION ACTIVITIES

Preconstruction activities included site surveys and studies, landowner agreements, engineering design, and configuring proposed project facilities:

Preconstruction Surveys and Studies

Preconstruction surveys were conducted to ensure the feasibility of the Proposed Action and to avoid, minimize, or mitigate impacts to existing resources. A full summary description of these surveys and their use follows.

Meteorological studies were conducted for 1 year to determine the characteristics of the wind resource in the project vicinity. The results of these studies were used to ensure project feasibility and determine the most efficient location of the wind turbines.

A Class I cultural resources study (record search) and Traditional Cultural Property (TCP) survey was conducted to research and document the location of these resources with respect to the Proposed Action. A Class III cultural resources survey (intensive ground survey) was conducted for the areas associated with Phase I of the Proposed Action. A Class III cultural resources survey would be conducted for all areas of subsequent development. The locations of all facilities would be adjusted to avoid the cultural and TCP resources.

Wetlands surveys were completed for the Proposed Action to determine the presence of jurisdictional and non-jurisdictional wetlands in the project area. The locations of the facilities would be adjusted to avoid and minimize wetland impacts.

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Wildlife surveys were completed in the vicinity of the Proposed Action. These surveys included a stick-nest survey for tree nesting raptors, a lek survey for sharp-tailed grouse, and spring point-count surveys to determine avian species composition. The surveys were designed to document wildlife use on the site and ensure that the Proposed Action would not be located in an area used extensively by sensitive wildlife species.

Landowner Agreements

The project proponents entered into agreements with landowners in order to secure rights to access their property for surveys, testing, construction, operation, and maintenance of the project components. These agreements were developed in consideration of landowner concerns, and include compensation for disturbance and loss of farming access during project construction, operation, and maintenance.

Landowner agreements have not yet been secured for all of phase II of the project.

Project Planning & Design

Project planning considered project components, equipment, and material sources available for use in construction and operation. The location and design of all project facilities would avoid sensitive resources. Generally, land requirements and disturbance areas for each of the components are shown in Table 2-1.

Gravel and Fill

Staging and construction activities associated with the Proposed Action would require access to gravel. During construction, gravel will provide a surface suitable for working during wet conditions. As described later in this chapter, some permanent access roads will remain graveled after construction to support access during all weather conditions. It has been determined that gravel for these activities would be supplied by local gravel pits which have been identified by the construction contractors as sufficient to meet staging and construction needs. The selected contractor's current gravel source is located in the East ½ Northwest ¼ Section 27, Township 144 North, Range 80 West. Metcalf Archeological Inc. has verified that this gravel pit is in compliance with the North Dakota Department of Transportation's (NDDOT) requirements for cultural resources clearance. Metcalf would include documentation to this affect in the final cultural resources report which would be submitted to the SHPO and Western to satisfy the

conditions of their concurrence letter. If additional sources of gravel or fill material are required during project construction, those sources would be surveyed or documentation would be provided to ensure cultural resource clearances are obtained.

**TABLE 2-1
Summary of Disturbances**

Component	Construction Requirements (temporary)	Maintenance/Operations Requirements (long-term)
Turbines	500 feet by 500 feet including associated laydown	50 feet by 50 feet
Turbine Transformers	Within turbine construction area	6 feet by 6 feet
Access Roads to turbines	7.2 miles 40 feet wide disturbance within 100 feet wide construction ROW	7.2 miles 32 feet wide
Underground Lines (trenches)	8 miles long Disturb area no more than 50 feet wide within 100 feet wide construction ROW	Trenches filled, regraded, and vegetated. No permanent surface disturbance
Overhead Sub-transmission Line	50 by 50 feet at each structure within 100 ft ROW	3 feet by 3 feet at each structure
Collection Substation	2 acres	2 acres
Laydown Area	15 acres	15 acres
230-kV Transmission Line	50 feet by 50 feet	7 feet by 7 feet
Temporary Tap	100 feet by 100 feet with 133 foot construction right of way	Restored to original contour and vegetated following construction of permanent switching station
	50 feet by 50 feet temporary maintenance area	
Switching Station	470 feet by 750 feet	470 feet by 750 feet

PROPOSED FACILITIES

Burleigh County Wind expects to bring the proposed Wind Energy Center online within approximately 90 days from the start of construction. Construction impacts would be temporary and would include the use of bulldozers, graders, trenching machines, concrete trucks, tractor-trailer trucks, and large cranes.

The proposed project facilities would consist of the following components and are described sequentially from the Wind Energy Center to the point of interconnection – generally east to west within the proposed project area:

Wind Turbines – Turbines would be used to convert wind energy from the Wind Energy Center into electrical energy.

Access Roads – Gravel roads would be installed to provide access to each turbine and along the proposed new 230-kV transmission line to allow for construction, operation, and maintenance activities.

Electrical Collection System (underground and overhead 34.5 kV sub-transmission lines) – The overhead and underground sub-transmission lines would be used to transmit electricity from each of the wind turbine transformers to the electrical collection substation.

Electrical Collection Substation – The collection substation would be used to transmit electricity from the turbines to the 230-kV high voltage transmission line,

Laydown Yard – The laydown yard would be used for the storage of construction materials and equipment (see Burleigh County Wind Laydown Yard for further details).

230-kV High Voltage Transmission Line – The 230-kV high voltage transmission line would connect the electrical collection substation to the point of interconnection at Western's existing Garrison-Bismarck 230-kV Transmission Line.

Temporary Tap – The tap would be used to temporarily connect the 230-kV high voltage transmission line into the existing Bismarck-Garrison 230-kV Transmission Line,

Permanent Switching Station – The switching station would be used to provide a permanent point of interconnection between the 230-kV high voltage transmission line and the existing Bismarck-Garrison 230-kV Transmission Line.

The following criteria were considered in the planning of project components of the Proposed Action:

- Establish a thousand-foot radius from turbine sites for safety, noise, vibration, and shadow flicker buffer zones for residences.
- Avoid and minimize impacts to avian species through avoidance of high use areas relative to surrounding areas.
- Avoid unnecessary wetland disturbances, including a 50-foot avoidance buffer from all wetlands not previously converted to agricultural use, and permit all necessary disturbances to wetlands.
- Avoid cultural and historic resources.
- Comply with permits and applicable Federal state, and local regulations.

Roads would be constructed and upgraded prior to installation of the proposed facilities. Existing and new roads would be used to move equipment, personnel, and materials during the construction, maintenance, and operations of the Proposed Action. Heavy equipment related to the construction phase of the Proposed Action would gain access to the Wind Energy Center via the existing gravel roads (93rd Street, 66th Street, and 52nd Street traveling south from State Highway 36).

Civil Construction –New access roads, serving all facilities associated with the Proposed Action would be constructed from existing street and avenue routes. Topsoil would be salvaged from road areas and replaced on roadside slopes and other associated areas following construction to provide a reclaimed growth medium. All access roads would be constructed in association with the wind turbines. No new access roads are required for collector or transmission lines. Graded surfaces within the footprints of the laydown area, substation, and switching station are separately described in associate with the facilities' descriptions.

Roads serving the turbines would be graded and compacted to a total width of approximately 32 feet to facilitate large truck travel. The length of new and upgraded roads required for access to the initial 33 turbines is 7.2 miles. The locations and lengths of roads required for the expansion array and overhead collection transmission line have not yet been determined.

Wind Turbines

The Proposed Action would include construction of an initial 33 turbines that would be constructed during the year 2005 and placed in operation prior to December 31, 2005. Up to 33 additional turbines would be planned and constructed in 2006, or subsequent years, for a total of up to 66 turbines. The proposed turbine arrangement, or "array", for both phases is shown in **Figure 2-1**; however, only the first 33 turbine locations have been finalized. As with the initial installation, expansion turbines would be sited to make best use of the wind resource and avoid or minimize impacts to sensitive areas.

Figure 2-2 provides a diagram and photograph of the GE horizontal axis, three-blade propeller turbines. The approximate height of the turbines would be 360 feet from the top of the swept area to the ground surface. The bottom of the swept area above the ground surface would be approximately 160 feet. These heights would allow the turbines to take advantage of more consistent and less turbulent winds.

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Construction

A photo series depicting the typical process of erecting a turbine is located in **Appendix A**. All activities related to wind turbine construction would occur within a 500 feet by 500 feet area centered on the turbine site. Wind turbine and access road construction is typically accomplished in the following manner:

Civil Construction – Civil work is usually performed about 3 to 6 weeks prior to the start of any other construction activities. Civil construction entails surveying, clearing, grubbing, excavating, and constructing turbine foundations.

An area of approximately 50 feet by 50 feet would be cleared with a bulldozer and/or road grader and excavated with a backhoe to prepare for each concrete foundation. Excess excavated material would be used for road construction or otherwise disposed of in accordance with all applicable regulations and permit conditions. An aluminum tube and bolt cage would be installed inside and concrete placed into the hole. Approximately 150 cubic yards of concrete would be needed for each turbine. Concrete spoil would be disposed of off-site by the contractor. Once cured, the foundation would be complete and ready to receive the turbine tower.

Delivery and Access – Major wind turbine components (including rotor assemblies, towers, power cables, and transformers) would be delivered to the wind project site by tractor-trailers on existing and/or developed access roads. A 500-foot-wide construction easement would extend along each turbine access road and turbine foundation allowing for rotor assembly, installation of underground and aboveground electrical facilities, and access road construction.

Structural – Turbine and tower assembly, and erection of the towers onto the turbine foundations, would be completed during this task. This work would also include installation of all mechanical and electrical systems associated with the turbines.

Testing – The testing period would start well into the proposed project, usually 3 to 6 months after the start of construction, and would typically last 2 to 3 months. This phase would include all the testing required to make the Wind Energy Center commercially operational. This incremental process would involve energizing the collection substation and bringing each turbine online until the commercial operation date.

Restoration and Final Project Completion – This last task in wind project construction would entail restoration and cleanup of all project disturbances. Areas of permanent disturbance at each turbine would include those areas occupied by turbines and access roads. Areas temporarily disturbed during

construction would be restored to pre-construction conditions. Additional details related to reclamation and restoration are presented in the Restoration and Reclamation section of this document.

Operation and Maintenance

The Wind Energy Center would be supported by two full-time technicians during normal business hours. Maintenance activities would occur periodically, resulting in approximately one truck trip along project roads per day from spring through fall, and periodic visits to project turbines and substations during the winter. Equipment to be stored at the Burleigh County Wind Laydown Yard and used at the project for operation and maintenance activities would include the following:

- One service truck on site;
- One small bulldozer with a forklift and snow plow;
- One road grader that would be shared with other projects;
- One 4-wheeler; and,
- One snowmobile.

To facilitate operation and maintenance, project access roads would be graded as necessary. Maintenance activities would be limited to areas accessible by these roads

Each turbine would be serviced twice a year. Typical turbine servicing activities would include temporarily deploying a crane within the construction easement of each turbine, removing the turbine rotor, replacing generators, bearings, and deploying personnel to climb the towers to service parts within the turbine.

Computer systems inside each turbine would perform self-diagnostic tests and allow a remote operator to set new operating parameters, perform system checks, and ensure turbines are operating at peak performance. Turbines would automatically shut down if sustained winds reach 56 miles per hour (mph) or gusts reach about 100 mph. The Wind Energy Center would be monitored and operated year-round by Burleigh County Wind.

Collection System

A sub-transmission line collection system consisting of a 1750 KVA, 3 phase pad mounted transformer at each turbine would connect to a network of underground 34.5kV and overhead 34.5kV transmission lines.

This system would collect the electricity generated by each of the 33 individual turbines and transmit it to the electrical collection substation.

Construction

Transformers

Pad-mounted transformers would be located within 20 feet of the base of each turbine tower. The approximately 5-foot-square steel transformer box, housing the transformer circuitry, would be mounted on an approximately 6-foot-square fiberglass box pad. **Figure 2-3** shows a typical pad mounted transformer and its location near the base of a turbine tower.

Underground Collection Line

Approximately 8 miles of underground collection line would be installed for the first 33 turbines and an additional 8 miles would be installed for the expansion array. The collection line cable would consist of a 1,000,000 circular mils (1,000 MCM), 4/0 cable buried in trenches at a depth of 42 to 54 inches (nominal depth of 48 inches). Trenches are anticipated to be approximately 2 feet wide and 4 feet deep and would generally follow access roads. However, where shorter distances could be achieved through more direct paths, the shorter routes would be implemented as shown in **Figure 2-1**.

Trenches would be excavated using both a trencher and a backhoe. Disturbance associated with all buried collection lines would be limited to a 100-foot wide construction corridor associated with each proposed linear disturbance. All trenches would be filled with compacted material and associated disturbances would be reclaimed following burial of the electrical cables (see the section on Reclamation/Restoration for further details). Above-ground utility warning markers would be installed at appropriate intervals to ensure safety and line integrity.

Overhead Collection Line

Approximately 1.6-miles of overhead 34.5-kV sub-transmission collection line (collection line) would be constructed along 52nd Street to collect power from the northernmost turbines (see **Figure 2-1**).

Underground lines would also be connected to this common overhead line, which would eventually connect to the collection substation. Collection lines from the southernmost four turbines would be buried and connected directly at the collection substation.

Project development associated with the eastern expansion would include construction of an additional 6.4 miles of overhead 34.5-kV collection line. This line would be installed outside of the existing road right-of-way (ROW) along 279th Avenue, as shown in **Figure 2-1**.

Single wood-pole structures would be used for the overhead collection line. Wood poles are readily available, can be installed using simple construction techniques, and can be easily modified or replaced to reduce outage time during emergencies. In addition, the life expectancy of these poles is approximately 45 years.

Typically, 10 percent of the pole length plus 2 feet is buried (i.e., an 80-foot pole would be buried 10 feet). An approximately 24-inch auger would be used to drill holes and a crane or boom truck would be used to set the structures in place. Soil excavated from the holes would be backfilled and compacted to ensure stability and drainage away from the structure.

The structures would be spaced approximately 300 feet apart. Using these spacing standards would require approximately 15 structures per mile. Disturbance at each structure would likely average 50 feet by 50 feet, and would be confined to the 100-foot temporary construction corridor. Permanent disturbance would include the site occupied by the poles (a footprint of less than 3 feet by 3 feet). An illustration of powerline stringing techniques is shown in **Figure 2-4** and more fully described later in this chapter. An illustration of an example overhead 34.5-kV collection line structure is shown in **Figure 2-5**.

Operation and Maintenance

Transformers

Pad mounted transformers would be maintained as part of normal operations and maintenance activities and would be accessed from the turbine access road. In the event of transformer failure, replacement of this equipment could be accomplished from the turbine access road.

Underground Collection Line

Periodic maintenance of underground collection lines would be required during the life of the project. Maintenance activities are permitted under the landowner easement agreements and would be conducted within the established easement width. Maintenance disturbance associated with all buried collection lines would be limited to a 100-foot wide construction corridor associated with each proposed linear disturbance. All trenches would be filled with compacted material and associated disturbances would be reclaimed following burial of the electrical cables. These activities would be conducted in compliance with applicable Federal, state and local regulations and the terms of the landowner easement.

Underground collection lines are relatively maintenance free and maintenance would be on an as needed

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basis only; consequently maintenance activities would not be frequent and would require excavation only in isolated areas, rather than the entire line.

Overhead Collection Line

Periodic maintenance of overhead collection lines would be required during the life of the project. Maintenance activities are permitted under the landowner easement agreements and would be conducted within the easement width. Typical tasks would include periodic inspections, structure and hardware replacement, and line maintenance activities. These activities would be conducted in compliance with applicable Federal, state and local regulations and the terms of the landowner easement and be managed by the onsite O&M Staff.

Collection Substation

An electrical collection substation would be built as part of a 17 acre lay down and substation area adjacent to the Burleigh County Wind Energy Center turbine array. This substation would be owned by Burleigh County Wind. The substation would be designed in compliance with Federal, state, and local regulations, and prudent industry practices.

At the collection substation, the 34.5-kV collection voltage would be converted to 230 kV to connect to the proposed new 230-kV transmission line. There would be two 34.5-kV breakers in metal-clad switchgear (building) for the two electrical circuits and one 34.5-kV breaker for the capacitor bank. The two circuits would feed into the power transformer with one 230kV breaker between the power transformer and the 230-kV Transmission Line. The ancillary equipment at the substation would consist of metering, relays, switches, control panel, relay panels, and lighting. The substation would have a footprint of no greater than 2 acres as shown in **Figure 2-1**.

The substation would have a gravel base. It would contain circuit breakers, transformers, switches, lightning protection, ground wires, a control building, and three, approximately 25-foot tall wood transmission line structures holding emergency lighting for the substation. The 6 foot (minimum height) fence surrounding the substation would be partially buried and topped with barbed wire. A photo of a typical collection substation is shown in **Figure 2-6**.

Breakers automatically interrupt power flow on a transmission line at the time of an electrical fault. The type of breaker planned for the proposed substation, called a gas breaker, would be insulated by special

non-conducting gas (sulfur hexafluoride [SF₆]). Small amounts of hydraulic fluids would be used to open and close the electrical contacts within the breaker.

Construction

The collection substation area would be surveyed, cleared, and graded prior to installation. The surface would be graded in compliance with storm water control plans and other applicable permit requirements. Gravel would be delivered to the site after all subsurface work is complete (grounding, equipment foundations, etc.) and leveled to create a surface for the installation of the above ground substation equipment as described above. The substation equipment would be delivered on tractor-trailer trucks and installed on top of a concrete foundation in the graveled area. Three 25-foot tall wood transmission line poles would be buried in the ground to an appropriate depth using an auger. The main power transformer would have secondary containment (concrete) for spill prevention in accordance with the design, applicable codes and the SPCC plan. All areas would be graded to ensure proper drainage and runoff control in accordance with applicable regulations.

Operation and Maintenance

The collection substation would be maintained by operations personnel throughout the year. The fenced yard would accommodate approximately five pick-up trucks that would allow for visits by contractors or Burleigh County Wind personnel.

SF₆ is a greenhouse gas. The use, storage and replacement of SF₆ would be monitored and managed to minimize any releases to the environment. SF₆ gas in substation circuit breakers would be contained within sealed units. Equipment as delivered from the manufacturer would be required to be factory-tested and certified not to leak. After installation, the equipment would be scanned for detection of leaks, and repairs made as appropriate. During use, the equipment would be monitored by periodic substation inspections for indications of leakage. During servicing, SF₆ gas would be evacuated using sealed gas containment equipment, thereby remaining totally contained.

Burleigh County Wind Laydown Yard

During construction, a laydown area would serve as the temporary storage location for power structures, conductor spools, turbine parts, and other transmission line materials and equipment. The long term use of this area would include temporary staging for maintenance operations.

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