5 Cumulative Impacts

The CEQ regulations for implementing NEPA define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

5.1 METHODS

Cumulative impacts were assessed by combining the effects of past activities, present ongoing activities, and reasonably foreseeable future actions with the potential effects of the Proposed Project and Wind Partners' proposed development. Each of the resource categories were analyzed, however, differences between the two alternative sites were considered marginal for this cumulative impacts analysis of past, present and reasonably foreseeable actions and therefore both sites were addressed simultaneously.

The CEQ regulations (40 CFR 1508.7) further explain, "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." Based on these regulations, if the project does not have direct or indirect effects there can be no cumulative effects resulting from the project because there would be no impacts added to past, present, or reasonably foreseeable actions. Because the No Action Alternative has no direct or indirect effects on any resources, it would have no cumulative impacts and is not further evaluated in this chapter. Anticipated Proposed Project Component activities and resultant effects were described in **Chapters 1** through **4** of this FEIS.

The ROI varies by resource, as described in **Chapter 3**, Affected Environment, and was considered for the cumulative impacts assessment as the spatial boundary for the affected area for each resource. The temporal boundary for those resource areas is confined to the project description included in **Chapter 2**, Alternatives and Proposed Federal Actions. The Applicants would like to begin construction in mid-2010 and complete construction by the beginning of 2011 for the Proposed Project and the Wind Partners' proposed development.

During the scoping process, agencies, organizations, tribes and the public were invited to provide input on the scope of the Proposed Project Components. This same opportunity was provided upon release of the DEIS on January 15, 2010, and with the 45-day public comment period. During this time, a public hearing and an interagency meeting were conducted. Through the DEIS review process, the NPS and USFWS provided similar comments on cumulative effects regarding the potential for development of other wind projects outside the ROIs for visual and biological resources, defined in **Chapter 3**, Affected Environment. Subsequently, the biological and visual cumulative impact discussions have been expanded for the ROI as described in **Section 5.4.2** and **Section 5.4.4**, respectively.

5.2 PAST AND PRESENT ACTIONS

Evaluation Process

Past and present development activities that have impacted the ROI and that were considered useful and relevant to this cumulative analysis include land use within the site alternatives, overall renewable energy development, wind facilities and utility infrastructure and capacity.

Past and Present Actions Included in Cumulative Analysis

<u>Baseline Conditions</u>

The land use within the site alternatives is described in **Section 3.6**, with impacts described in **Section 4.6**. The ROI for land use includes areas of immediate disturbance associated with the Proposed Project Components and proposed Federal actions. The majority of the region, including both site alternatives, is currently used for rangeland and agriculture; additionally, Western's Wessington Springs and Winner substations were identified as industrial uses. Agriculture, sporadic farmsteads and road infrastructure are existing and ongoing activities. For purposes of analyzing cumulative impacts, those past and present activities were considered part of the baseline condition of the areas.

<u>Overall Wind Energy Development</u>

Wind and other renewable sources are expected to become a larger share of the total electric generation resource in the U.S. for several reasons, primarily a desire to reduce overall GHG emissions, help increase energy security, and aid in economic stimulus efforts. Local, State and national energy policies are increasingly incorporating renewable portfolio standards, with wind as a major component, and targeting implementation of such standards by 2020 or sooner. Consequently, installation of wind and other renewable generation has increased dramatically, especially in the last 8-10 years. Between 2002 and 2006, wind generation (in thousands of kilowatt hours [kWh]) rose from approximately 10,400,000 to 26,600,000 (EIA 2008). In 2008, approximately 8,500 MW of new wind energy were installed in the U.S., representing roughly 40% of new power producing capacity, and making wind the second largest new generation source (AWEA 2009). Statewide, South Dakota and North Dakota are rich in wind energy resources (NRC 2007) and are included in this cumulative impacts analysis for a broader perspective. For comparison showing additional states' projects see **Figure 5.1** for a depiction of the Midwest Independent Transmission System Operator (MISO) projects with approved interconnection agreements. Additional information regarding the MISO is provided below (MISO 2010).

> The MISO is an independent, nonprofit organization that supports the reliable delivery of electricity in 13 U.S. states and the Canadian province of Manitoba. This responsibility includes ensuring the reliable operations and administering the regions' interconnected high voltage power lines that support the transmission of more than 100,000 MW of energy in the Midwest.

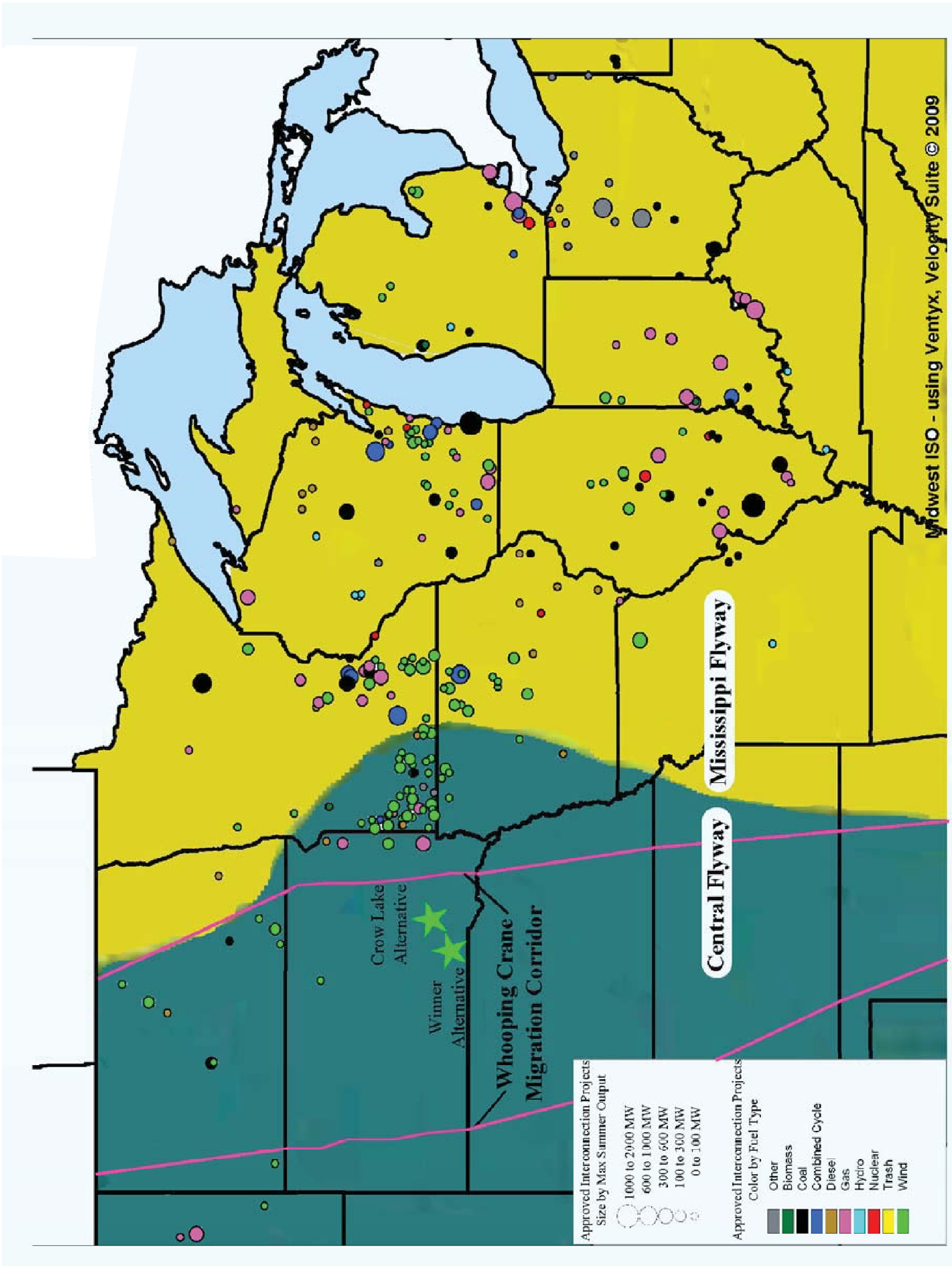

Figure 5.1 Midwest Independent System Operator Approved Interconnection Projects and Migratory Flyways

The Federal Production Tax Credit, recently extended through the American Recovery and Reinvestment Act of 2009, has been a major incentive for wind energy development. With the recent economic downturn, difficulties in obtaining credit reportedly have hampered the addition of wind power capacity by some developers. Also in early 2009, the EPA declared that GHGs are a threat to human health, which may lead to additional regulatory or legislative action to reduce GHG emissions.

Wind Energy Facilities in South Dakota

The following provides a summary of existing wind energy facilities in South Dakota (SDPUC 2009b; 2010).

> The state's first large scale wind farm was constructed in 2003 near Highmore. The 27 turbine, 40.5 MW project was built by FPL Energy (now NextEra Energy). In 2006, PPM (now Iberdrola) began developing the southern tip of the Buffalo Ridge area in South Dakota, just east of Brookings. The company built the Minn-Dakota Wind Farm (54 MW) in 2007, followed by Buffalo Ridge I (50.4 MW) in 2009 and recently started construction on Buffalo Ridge II (210 MW). In Day County, NextEra Energy has also begun construction on a 99 MW project. The Coteau des Prairies land formation, which runs from northwestern Iowa, through southwestern Minnesota (known there as the Buffalo Ridge), eastern South Dakota and up into North Dakota, sits in a great wind resource and, more importantly in South Dakota, close to transmission and a market for power. Most of this 200-mile ridge has been leased by developers and will likely be developed in the near term.
>
> The Coteau des Prairies/Buffalo Ridge has not been the only location in South Dakota developed for wind energy production; other developers have found niche areas in the state. Spanish developer Acciona built Tatanka I in 2008 near Long Lake on a ridge that dips down from North Dakota. This 180 MW project straddles the North Dakota-South Dakota border, with 88.5 MW on the South Dakota side along with a maintenance facility and a transmission substation. The ridges west of the James River Valley have also seen development including the previously mentioned South Dakota Wind Energy Center near Highmore as well as the newer Wessington Springs Wind Farm (51 MW), built by Babcock & Brown in 2009, and Titan I (25 MW) near Ree Heights, developed by BP Alternative Energy and launched in December of 2009. Most recently, the Day County Wind Project, 20 miles east of Groton, South Dakota and featuring 66 turbines and 99 MW, began construction in October of 2009 and was placed into operation as of April of 2010.
>
> Large-scale wind farms, although typically the most economical, have not been the only wind development in South Dakota. Both small residential and older, rebuilt larger turbines have been installed recently in South Dakota. With Federal tax incentives increasing during the last two years, residential turbines have become very popular. Resalers are popping up throughout South Dakota. The number of 2 to 10 kW turbines installed have been too numerous for the SDPUC to accurately track. The Wind for Schools program is an example of small-scale wind development. You can find more information about that program at wac.sdwind.org.

Buffalo Ridge II is the single large-scale wind project in construction at this time. **Table 5.1** provides a comprehensive list chronicling wind projects in South Dakota that are either existing, under construction or have been determined to be reasonably foreseeable as described in **Section 5.3**. See **Figure 5.2** for an illustration of those projects and their general locations in South Dakota.

Wind Energy Facilities in North Dakota

Table 5.2 provides a comprehensive list chronicling wind projects in North Dakota that have been determined to be either existing, under construction or have been determined to be reasonably foreseeable as described in **Section 5.3**. See **Figure 5.3** for an illustration of those projects and their general location in North Dakota.

Utility Infrastructure and Capacity

The Federal government has also recognized the need for improvement to the nation's transmission infrastructure and the alleviation of transmission constraints. The American Reinvestment and Recovery Act granted Western $3.2 billion in budget authority "… to construct, finance, facilitate, own, plan, operate, maintain or study construction of new and/or upgraded electric power transmission lines and related facilities … for delivering or facilitating the delivery of power generated by renewable energy resources constructed or reasonably expected to be constructed" (Western 2009).

Basin Electric has 406.36 MW (owned or purchased) generated from current wind energy facilities in North Dakota and South Dakota. These currently consume some of the transmission capacity identified as available.

Existing utility infrastructure within the Crow Lake Alternative area includes Western's existing transmission system including a 230-kV transmission line and the Wessington Springs Substation. In addition, the existing Wessington Springs Wind Project, a 51 MW wind energy generating facility (Western 2007), is located adjacent to the northeast edge of the Crow Lake Alternative. Existing utility infrastructure within the Winner Alternative area includes Western's transmission system, including a 115-kV transmission line and the Winner Substation.

Table 5.1 Existing and Reasonably Foreseeable Wind Energy Projects in South Dakota

Wind Project Name	Existing, In Construction or Reasonably Foreseeable	Location	Power Capacity	Units	Turbine Mfr.	Developer	Owner	Power Purchaser	Year Online	SDPUC Approval
Chamberlain	Existing	Chamberlain	2.6 MW	2	Nordex	Crown Butte Wind Power	Basin Electric	Basin Electric/East River Coop	2001	N/A
Howard	Existing	Howard	216 kW	2	Micon	MCCR & City of Howard	City of Howard	City of Howard	2001	N/A
Canova	Existing	Near Canova	108 kW	1	Micon	MCCR & City of Canova	City of Canova	City of Canova	2002	N/A
Gary	Existing	Gary	90 kW	1	Vestas	Energy Maintenance Services	Energy Maintenance Services	Energy Maintenance Services	2002	N/A
Carthage Turbine	Existing	Near Carthage	108 kW	1	*(unknown)*	MCCR & City of Carthage	City of Carthage	City of Carthage	2003	N/A
Alex Little Soldier Wind Turbine	Existing	Rosebud Sioux reservation	750 kW	1	Native Energy Micon	Native Energy, DISGEN and Rosebud Sioux	Rosebud Sioux	East River Electric	2003	N/A
SD Wind Energy Center / Highmore	Existing	Highmore	40.5 MW	27	GE Energy	FPL Energy	NextEra Energy Resources	Basin Electric	2003	N/A
Oaklane Colony	Existing	Near Alexandria	160 kW	*(un-known)*	*(unknown)*	Oaklane Colony	Oaklane Colony	Oaklane Colony	2006	N/A
Minn-Dakota	Existing	Brookings County	54 MW	36	GE Energy	Iberdrola Renewables	PPM Energy	Xcel Energy	2008	N/A
Sisseton Wahpeton Community College	Existing	Sisseton Wahpeton Community College	130 kW	*(un-known)*	*(unknown)*	Sisseton Wahpeton Community College and USDA	Sisseton Wahpeton Community College	Sisseton Wahpeton Community College	2008	N/A
Tatanka I	Existing	Near Long Lake, McPherson County	88.5 MW	60	Acciona	Acciona Energy	Acciona Energy	Midwest ISO	2008	N/A

Table 5.1 Existing and Reasonably Foreseeable Wind Energy Projects in South Dakota

Wind Project Name	Existing, In Construction or Reasonably Foreseeable	Location	Power Capacity	Units	Turbine Mfr.	Developer	Owner	Power Purchaser	Year Online	SDPUC Approval
Buffalo Ridge I	Existing	Brookings County	50.4 MW	24	Suzlon	Iberdrola Renewables	Iberdrola Renewables	Northern Indiana Public Service Company	2009	N/A
Titan I	Existing	Near Ree Heights, Hand County	25 MW	10	*(unknown)*	Clipper Wind and BP Alternative Energy	BP Alternative Energy	NorthWestern Energy	2009	N/A
Wessington Springs	Existing	Jerauld County	51 MW	34	GE Energy	Babcock & Brown	NextEra Energy Resources	Heartland Consumers Power District	2009	N/A
Day County	Existing	*(unknown)*	99 MW	66	*(unknown)*	NextEra Energy Resources	NextEra Energy Resources	Basin Electric	Expected mid-2010	N/A
Buffalo Ridge II	In Construction	Brookings and Duel Counties	210 MW	100	*(unknown)*	Iberdrola Renewables	Iberdrola Renewables	*Midwest ISO*	Expected late-2010	Yes
Buffalo Ridge III	Reasonably Foreseeable	Brookings and Duel Counties	170 MW	113	*(unknown)*	Heartland Wind, LLC	Heartland Wind, LLC	*(unknown)*	Estimated for Winter 2011	Reasonably Foreseeable
White	Reasonably Foreseeable	Brookings County	200 MW	103	*(unknown)*	Navitas	Babcock & Brown	*(unknown)*	*(unknown)*	Yes

Source: SDPUC 2009b and AWEA 2009b

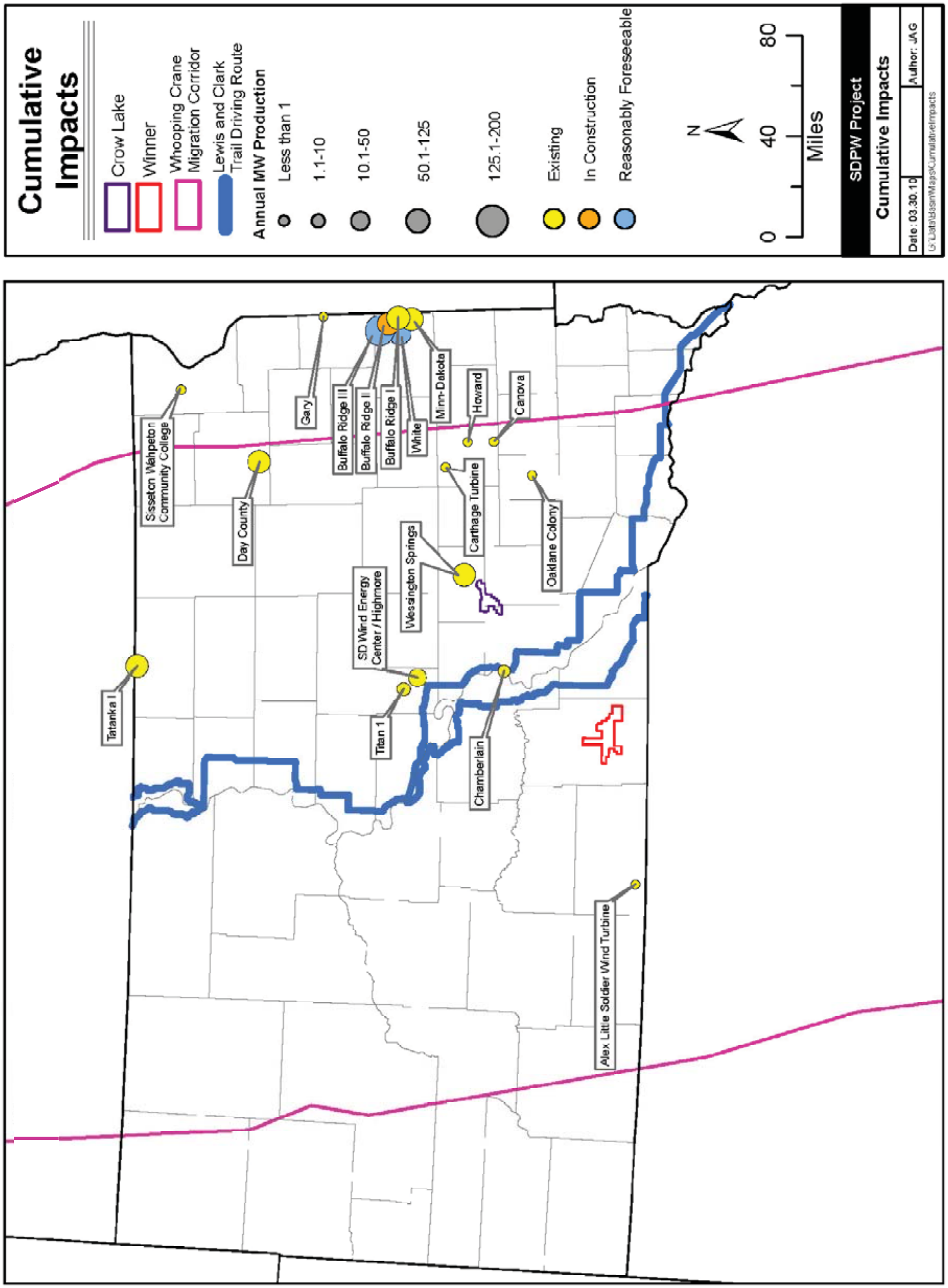

Figure 5.2 Existing and Reasonably Foreseeable Wind Energy Proejcts in South Dakota

Table 5.2 Existing and Reasonably Foreseeable Wind Energy Projects in North Dakota

Wind Farm Name	Existing, in Construction or Reasonably Foreseeable	Location	Power Capacity	Units	Turbine Mfr.	Owner	NDPSC Approval
3 Affiliated Tribes	Existing	New Town	6.5 kW	1	*(unknown)*	3 Affiliated Tribes	N/A
Ashtabula	Existing	Barnes County	200 MW	133	GE 1.5 MW	FPL - Ashtabula Wind, LLC	Yes
Belcourt	Existing	Belcourt	130 kW	1	Micon 108	Turtle Mountain Chippewa Tribe	N/A
Edgeley/Kulm	Existing	Edgeley	40 MW	27	GE 1.5 MW	FPLE / BEPC	N/A
Edgeley/Kulm	Existing	Edgeley	21 MW	14	GE 1.5 MW	FPLE / Otter Tail	N/A
Fort Totten	Existing	Fort Totten	130 kW	1	Micon 108	Spirit Lake Sioux Nation	N/A
Langdon Expansion	Existing	Cavalier County	40 MW	26	GE 1.5 MW	FPL- Langdon Wind, LLC	N/A
Langdon II	Existing	Cavalier County	40.5 MW	27	GE 1.5 MW	Otter Tail Corporation	N/A
Langdon Project	Existing	Cavalier County	118.5 MW	79	GE 1.5 MW	FPL- Langdon Wind, LLC	Yes
Luverne	Existing	Griggs/Steele counties	157 MW	105	GE 1.5 MW	M-Power LLC	Yes
Minot	Existing	South of Minot	2.6 MW	2	Nordex N60	BEPC - PrairieWinds	N/A
North Valley Career	Existing	Grafton	6.5 kW	1	*(unknown)*	North Valley Carreer and Technology Center	N/A
Oliver	Existing	Center	50.6 MW	22	2.3 MW Turbines	FPL - Oliver County Wind LLC	N/A
Oliver II	Existing	Center	48 MW	32	GE 1.5 MW	FPL - Oliver County Wind LLC	N/A
Petersberg	Existing	Petersberg	90 kW	1	NEG Micon NM52/901	Minnkota Power Cooperative	N/A
PrairieWinds	Existing	Ward County	115.5 MW	77	GE 1.5 MW	BEPC - PrairieWinds ND 1, Inc.	Yes
Rugby	Existing	Rugby	149.1 MW	71	Suzlon 2.1 MW S88	Iberdrola, Inc. f/k/a PPM Energy	Yes
Sacred Heart Monastery	Existing	Richardton	130 kW	2	Silver Eagle	Sacred Heart Monastary	N/A
Tatanka I	Existing	Dickey County	90 MW	60	Acciona AW 1500	Tatanka Wind Power, LLC	N/A
Turtle Mountain CC	Existing	Belcourt	66 kW	1	Vestas V47	Turtle Mountain Community College	N/A N/A
Valley City	Existing	Valley City	90 kW	1	NEG Micon NM52/900	Minnkota Power Cooperative	N/A
Velva	Existing	Velva	12 MW	18	Vestas V80	EHN / Xcel Energy	N/A

Table 5.2 Existing and Reasonably Foreseeable Wind Energy Projects in North Dakota

Wind Farm Name	Existing, in Construction or Reasonably Foreseeable	Location	Power Capacity	Units	Turbine Mfr.	Owner	NDPSC Approval
Wilton	Existing	Wilton	49.5 MW	33	GE 1.5 MW	FPL Burleigh County Wind LLC	N/A
Wilton II	Existing	Wilton	49.5 MW	33	GE 1.5 MW	FPL Burleigh County Wind LLC	N/A
Gascoyne I	Reasonably Foreseeable	Adams/Bowman counties	200 MW	133	GE 1.5 MW	Crown Butte Wind Power LLC	Pending
Logan County I	Reasonably Foreseeable	Logan County	368 MW	160	Mitsubishi 2.4 MW	Just Wind, LLC	Pending
Dickey County	Reasonably Foreseeable	15 miles NW of Ellendale	150 MW	100	GE 1.5 MW	Rough Rider Wind 1, LLC	Pending
Oliver County Expansion	Reasonably Foreseeable	6 miles NW of Center	1,000 MW	667	*(unknown)*	FPL Energy, LLC	Pending
Border Winds	Reasonably Foreseeable	Rolette and Towner Counties	150 MW	66	*(unknown)*	Sequoia Energy U.S. Inc.	Pending
Hartland	Reasonably Foreseeable	Ward, Burke, Mountrail counties	2,000 MW	*(unknown)*	*(unknown)*	Hartland Wind Farm, LLC	Pending
Bison I	In Construction	Oliver County	125 MW	*(unknown)*	*(unknown)*	Allete, Inc. (MN Power)	Yes
Merricourt	Reasonably Foreseeable	McIntosh/Dickey counties	150 MW	*(unknown)*	*(unknown)*	enXco	Pending
Emmons County	Reasonably Foreseeable	Emmons County	900 MW	*(unknown)*	*(unknown)*	Just Wind, LLC	Pending
Bison I	In Construction	Oliver/Morton counties	75.9 MW	33	Siemons 2.3 MW	Allete, Inc. (MN Power)	N/A
Cedar Hills	In Construction	Rhame	19.5 MW	13	GE 1.5 MW	Montana-Dakota Utilities	N/A
Ashley	Reasonably Foreseeable	McIntosh County	487.6 MW	212	*(unknown)*	CPV Ashley Renewable Energy Company, LLC	Pending
Baldwin	Reasonably Foreseeable	Burleigh County	99.0 MW	66	*(unknown)*	NextEra Energy Resources, LLC	N/A
Radiance	Reasonably Foreseeable	Burleigh County	99.0 MW	*(unknown)*	*(unknown)*	North Dakota Winds, LLC	N/A

Source: NDPSC 2010

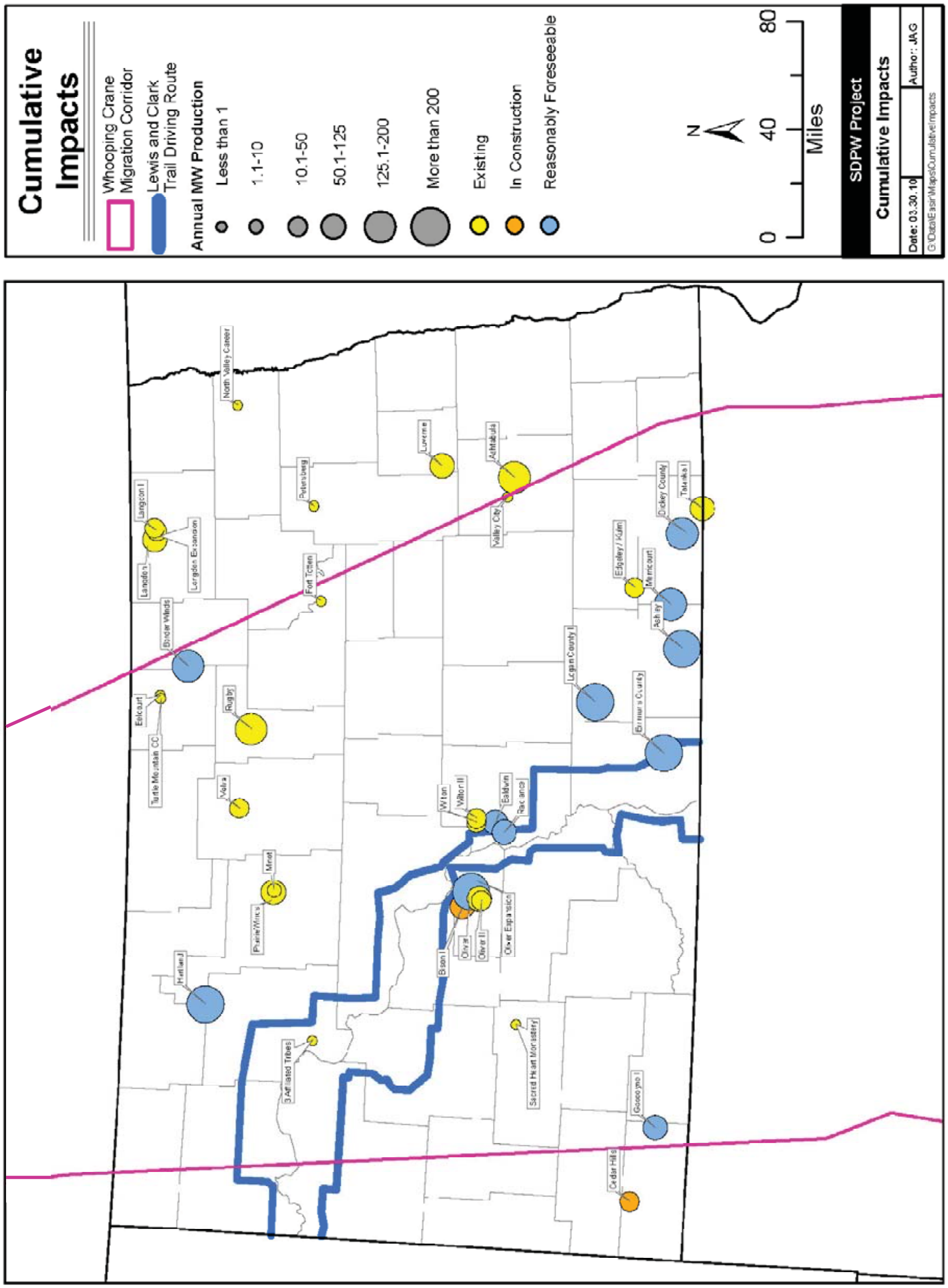

Figure 5.3 Existing and Reasonably Foreseeable Wind Energy Projects in North Dakota

5.3 REASONABLY FORESEEABLE FUTURE ACTIONS

Evaluation Process

Activities considered reasonably foreseeable future actions were evaluated based on the criteria listed below. Information was gathered to identify potential future actions in the following ways: contacting local county planning staff; reviewing regional planning documents; considering other EIS/EAs recently done for other projects in the region; and reviewing public feedback from the scoping and DEIS review/comment periods. The Agencies used the information gathered and applied the criteria below to determine which of these projects are speculative due to limiting factors and which are reasonably foreseeable to occur and relevant to the cumulative impacts discussion.

- **Transmission** – evaluate the availability and/or proximity to existing transmission paths necessary to direct the transmission of energy
- **Power purchase agreements** – identify a legal contract between an electricity generator and a power purchaser
- **Market availability** – analyze sufficient accessibility of an electricity market for the trade and supply of energy
- **Siting authorities/applications** – identify if an application has been submitted to a siting authority (*e.g.*, as a utilities commission, Public Utilities Commission [PUC] or Public Service Commission [PSC] that regulates the rates and services of a public utility, reviews and approves and/or denies applications for development of wind projects with a capacity of 100 MW or more)
- **NEPA process/Federal approvals** – identify if a project is under NEPA review (*e.g.,* Federal agencies are required to consider and disclose the potential environmental impacts of their "major" or "significant" proposed actions, prior to decision-making, to keep the decision-making process transparent and cooperative)
- **System studies and planning analysis** – determine if a project requires analysis or an evaluation of proposal design to determine the difficulty in carrying out a designated task, such studies precede technical development and project implementation

The subsequent discussion describes the activities determined to be reasonably foreseeable future actions, and those that were excluded from full cumulative impact analysis.

Reasonably Foreseeable Future Actions Included in Cumulative Analysis

Using the above criteria, only two projects have been identified as reasonably foreseeable. It is recognized that cumulative analysis may include other types of generation (see page 242 below) however, wind projects were the only actions determined to be reasonably foreseeable and pertinent to this analysis. Currently, the White Wind Project (200 MW, 105 turbines) that would be located in Brookings County, South Dakota, has approval from the SDPUC wind energy siting authorities and has completed an EIS; although it is not in construction at this time, these factors render the project reasonably foreseeable. The Buffalo Ridge III Wind Project (170 MW, 113 turbines) that would be located in Deuel and Brookings counties has released an NOI to prepare an EIS; it has potential to occur although it has not submitted a wind energy application to the SDPUC at this time, it is considered reasonably foreseeable.

Growth in wind generation is expected to slow appreciably through 2010, after having grown 50 percent in 2008 (EIA 2009). Nonetheless, the EIA forecast through 2030 indicates steady growth in wind capacity through 2012, after which capacity increases slightly, but essentially levels off, through 2030. In 2030, wind is forecast to be 2.5 percent of total generation. Also, an increase in the cost of carbon-based generation would make wind power more economical, which could drive wind development. If legislation allowed for the conversion of renewable energy credits to emissions offsets, wind development could be even more prolific (SDPUC 2009a). See **Figure 5.1** for a depiction of the MISO approved interconnection projects.

South Dakota is one of the top ranked States for potential wind development in the U.S., and has actively promoted development of wind energy. The State offers a wind energy tax credit and a reduced property tax for wind facilities; the wind energy credit was extended in March 2009. Although South Dakota has high wind potential, like many other States, it has not been fully developed because of the limited amount of installed transmission. The distance of the markets from the wind regions of South Dakota further compounds this issue.

Recognizing this, South Dakota and 4 nearby States have discussed integrated transmission development in support of wind energy that will promote regional electric transmission investment and cost sharing. The States working together are contributing to the Upper Midwest Transmission Development Initiative to identify energy generation resources, transmission projects and infrastructure needed to support those resources in a cost-effective manner. Over the next 10 months, participants will determine a reasonable allocation of costs for necessary infrastructure ultimately leading to the development of a concrete plan or tariff proposal for consideration by the MISO. See **Figure 5.4** for a depiction of existing utilities across South Dakota. It is important to reiterate that while the map depicts abundant existing utilities, the reality of capacity constraints, coupled with the characteristics of the aging transmission grid, lessen the possibilities of future wind energy development.

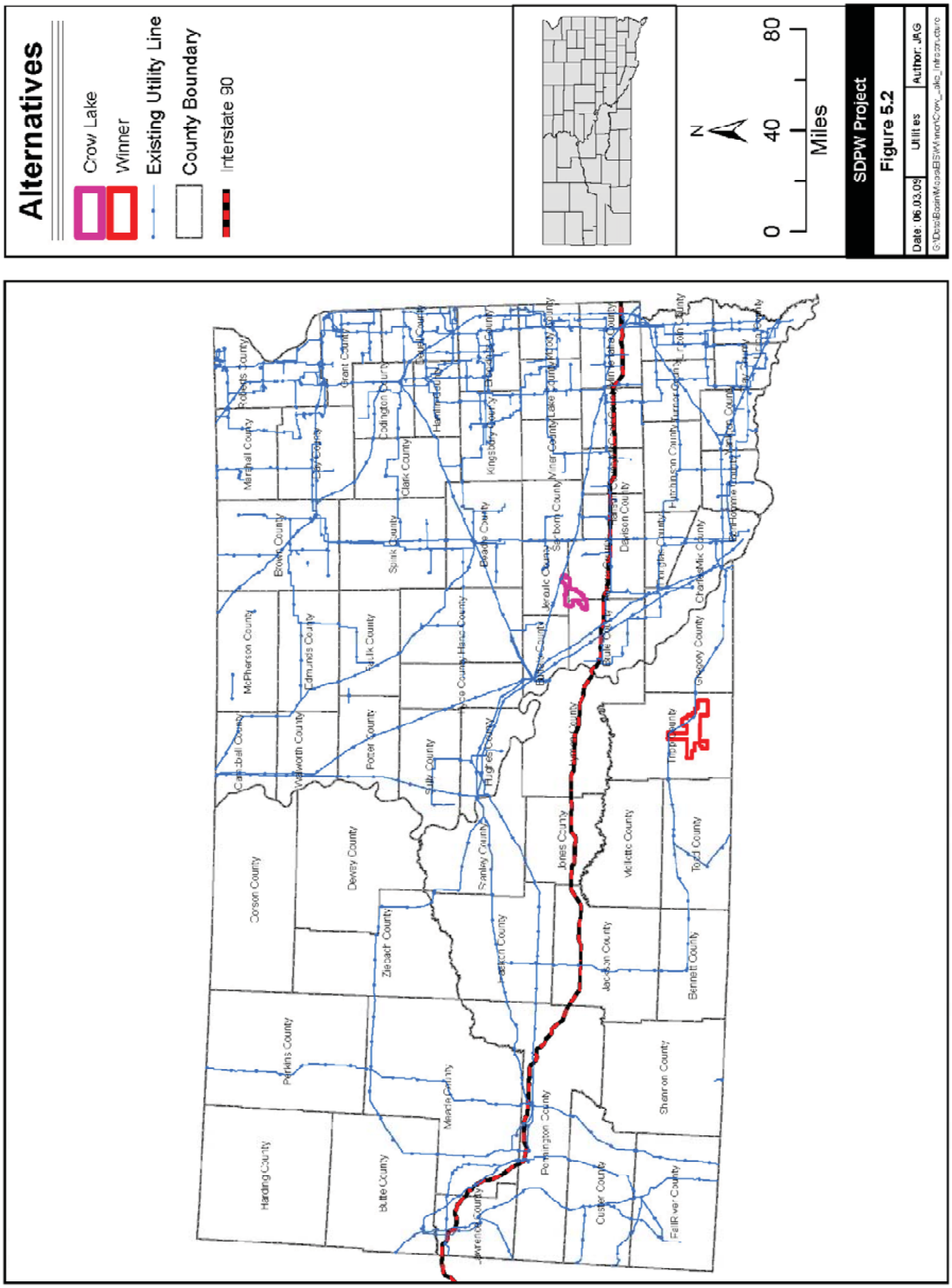

Figure 5.4 South Dakota Existing Utilities

Proposed Projects Excluded from Cumulative Analysis

Issues Affecting Wind Energy Development

Speculation exists about what is needed to drive more wind energy development in South Dakota. A wind project has three basic requirements that enable it to be realistic: wind resource, a buyer for the electricity and transmission to get it from the wind turbines to the load. The SDPUC states that South Dakota really has only one of those three to offer: the wind resource (SDPUC 2009b).

Wind development in South Dakota has increased over the last couple years, with the state moving from 40 MW to over 300 MW during that time. The SDPUC anticipates the State's generation development to double to 600 MW in 2010. Beyond these projects, however, development is likely to get more difficult. With 600 MW of total wind generation, South Dakota nears 30 percent of their peak load of just more than 2000 MW (SDPUC 2009b). At this level of wind integration, the state is nearing the limits of what the transmission system can handle without extensive upgrades and new transmission lines. Most of the exporting transmission is filling to capacity and electric load in South Dakota is not large enough to take on much more wind generation. The future wind potential in South Dakota is dependent on the ability to export it to larger markets (SDPUC 2009b).

The ability to export electricity lies solely on the expansion of high voltage transmission lines, mostly to eastern markets such as Minneapolis and Chicago. As utilities serving states to the east of South Dakota are required to buy more renewable energy to meet their states' requirements, the lowest cost power is likely to come from wind projects in the Dakotas. The two main barriers to developing those transmission lines are cost allocation and siting. Traditional cost allocation formulas recover transmission costs from customers within the geographic area that transmission is built. Without any changes, South Dakotans would end up paying for the transmission moving wind power to eastern customers. Everyone agrees the cost allocation formulas need to change; it is simply a question of what method is the most equitable. Although siting has not been as much of a concern in South Dakota, it is nearly impossible to build transmission lines through Minnesota, especially if there are no benefits attached for the landowner (e.g. wind turbine payments that will go to landowners in South Dakota). Siting new, high voltage transmission lines is a process that will take years but cannot start until the cost allocation formulas have been decided. South Dakota will not come anywhere near its real wind development potential until states in the region solve these two issues.

Communications with planning and zoning personnel from Aurora (Vissia 2009), Brule (Westendorf 2009), Jerauld (Reindle 2009), and Tripp (Hirsh 2009) counties did not identify any proposed projects within these counties. Based on the excellent wind resource in South Dakota, it is likely that more renewable energy and associated transmission projects will be proposed in the near future. However, the following actions were identified through the regional research conducted, but were excluded from the cumulative impacts analysis for the stated reasons.

South Dakota Economic Development Proposed Projects

South Dakota Governor's Office of Economic Development (SDGOED) has created a wind energy development map that identifies several existing and proposed wind projects (SDGOED

2009). Projects identified as "existing" and "under construction" were verified, included as past and present actions within the analysis area and are identified as "existing" in **Table 5.1**. White Wind Farm and Buffalo Ridge III were identified as reasonably foreseeable for the reasons described above. The remaining projects identified as "pending" or "proposed" were evaluated based on the criteria identified above and were determined to either have insufficient information available to be considered in the analysis or did not meet the evaluation factors to be deemed feasible at this time. Additionally, it is unlikely that the majority of the pending or proposed projects would be viable due to limited transmission capacity as identified by the SDPUC (SDPUC 2009b) as described above.

South Dakota State Transportation Improvement Plan Transportation Project

The 2010 to 2014 South Dakota State Transportation Improvement Plan (SDDOT 2009) identified projects associated with SR45 in Brule County and US183 in Tripp County. Both of these projects are identified as resurfacing projects and would occur during the 2011 to 2012 timeframe. These resurfacing projects have not been included in the cumulative impacts analysis because both would result in temporary impacts associated only with duration of the resurfacing project and would occur after completion of construction of the Proposed Project Components and, therefore, would not result in a cumulative impact.

Rosebud Sioux Tribe Wind Project

The Rosebud Sioux Tribe proposes to construct a wind project in Todd County approximately 2.5 miles north of Mission, South Dakota. The tribe currently has interconnection requests within Western's queue for 90 MW and/or 100 MW; however, system impact studies relating to these interconnection requests have not yet begun. Depending on the outcome of system impact studies, the tribe may develop the project as a 90 MW, 100 MW or 190 MW wind farm (Haukaas 2009). At this time, the Rosebud Sioux Tribe project proponents are conducting preliminary environmental studies. Because this proposed wind project is in preliminary study stages and is not sufficiently advanced in project development, it has been excluded from the cumulative impact analysis.

5.4 CUMULATIVE IMPACT ANALYSIS

Cumulative effects were evaluated for both the construction (anticipated to begin mid-2010 and complete by the end of 2010) and post-construction (operation) periods of the Proposed Project Components. As identified in **Chapter 2** (and for either site alternative), the "Proposed Project Components" include:

- Wind Turbine Generators and Foundations
- O&M Building
- Underground Communication System and Electrical Collector Lines
- Collector Substation and Microwave Tower
- Overhead Transmission Line
- Temporary Equipment/Material Storage or Lay-down Areas
- Temporary Batch Plant
- Crane Walks

- New and/or Upgraded Service Roads to Access the Facilities

As identified in **Chapter 4**, the impacts to the following resources are anticipated to be minimal and primarily occur during construction: geology and soils, water, land use, transportation, noise, socioeconomics, environmental justice, and health and safety. Additionally, there are no other proposed projects identified within the ROI that would potentially impact the aforementioned resources, therefore, these resources will not be further evaluated for cumulative impacts. Where applicable, the Applicants' and Agencies' standard BMPs (see **Table 2.2)**, and Applicants' APMs (see **Table 2.3**) have been included and would be used for the Proposed Project Components and proposed Federal actions as appropriate, thereby reducing or eliminating the potential for incremental effects resulting from the Proposed Project Components.

5.4.1 CLIMATE CHANGE AND AIR QUALITY

Cumulative impact analysis for climate change includes consideration of the ROI for the project, and State and national GHG emission reduction efforts. Current national and State practices include the inventory of GHG emissions to compare the relative contribution of different emission sources and GHG emissions to climate change. According to the EPA (2010), "a GHG inventory is an accounting of the amount of GHGs emitted to or removed from the atmosphere over a specific period of time (*e.g.*, one year). A GHG inventory also provides information on the activities that cause emissions and removals, as well as background on the methods used to make the calculations. Policy makers use GHG inventories to track emission trends, develop strategies and policies and assess progress. Scientists use GHG inventories as inputs to atmospheric and economic models. To track the national trend in emissions and removals since 1990, EPA develops the official U.S. GHG inventory each year. The national GHG inventory is submitted to the United Nations in accordance with the Framework Convention on Climate Change. In addition to the U.S. inventory, GHG emissions can be tracked at the global, State and local levels as well as by companies and individuals. "

CO_2 is one of six GHGs that contribute to climate change. CO_2 emissions represent approximately 84 percent of all GHG emissions in the U.S. The greatest advantage of wind power is electricity generation without air emissions, including CO_2. Within South Dakota, CO_2 emissions resulting from fossil fuel combustion totaled 13.78 million tons in 2007 (EPA 2009a). Of these, activities related to the generation of electric power accounted for 2.96 million tons of CO_2 emitted in South Dakota (EPA 2009a). Further, operation of the Proposed Project Components would avoid 726,600 metric tons of CO_2 emissions per year (EPA 2009b) compared to the average emissions of fossil fueled generating stations employed in South Dakota; thus, contribute to the national and State efforts to minimize GHG emissions. Implementation of the proposed development would therefore not contribute to cumulative effects on air quality or climate change.

5.4.2 BIOLOGICAL RESOURCES

There are three cumulative impact analysis areas for biological resources: the ROI (project area boundary) for vegetation, mammals (excluding bats), reptiles, amphibians; the Aransas-Wood Buffalo migration corridor for whooping crane; and the South Dakota portion of the Central Flyway for bats and birds, excluding whooping crane.

Some biological resources would be impacted due to the construction and operation of the Proposed Project Components. Construction would result in the permanent loss of a small amount of native vegetation and wildlife habitat, and could result in a minor number of mammal, reptile, and amphibian mortalities. Impacts to these biological resources resulting from the Proposed Project Components would be minimal within the ROI, and incremental impacts are not anticipated to increase cumulative impacts due to the low degree of impacts in a very localized area. The past, present and reasonably foreseeable actions carried forward in the cumulative impacts analysis (**Table 5.1** and **Table 5.2**) are geographically isolated from the Proposed Project Components, are not in the project area boundary's cumulative impact analysis area, and those species that use habitats in these areas are not connected to the same populations in the ROI because of their relatively small home ranges.

Given the current economic climate, transmission constraints, and market availability, it is difficult to accurately predict the actual growth of wind energy in South Dakota and other top wind states – many of which also lie within the whooping crane migration corridor. However, the number of wind projects and associated infrastructure is growing, and will likely continue to grow into the near future. Research on how whooping cranes respond to turbines remains nascent, so it is difficult to predict the cumulative impacts of wind energy project development and disturbance within the whooping crane corridor. It can be assumed that as development and disturbance within the migratory corridor continues to increase, stopover habitat quality and quantity would continue to degrade.

Past activities that have affected habitat in the Project area include conversion of native vegetation and CRP lands for farming, construction of the Wessington Springs Wind Project, and construction of roads, transmission lines, and residences. Development of electrical power generation and transmission within the crane migration corridor (**Table 5.1, Figure 5.2, Table 5.2,** and **Figure 5.3**) has contributed to a baseline condition that presents considerable risk to a small and vulnerable crane population. Continued development of power generation and transmission within the Aransas-Wood Buffalo migration corridor, whether from renewable or non-renewable sources, will increase the potential for collisions with structures and loss or avoidance of stopover habitat. Implementation of the whooping crane monitoring program (BA, **Appendix G**) and proposed habitat offsets will help reduce incremental impacts to the whooping crane resulting from the Proposed Project but the project will add to cumulative effects to the Aransas Wood Buffalo Population. A BA was prepared under Section 7 of the ESA Western, and RUS and Applicants will follow USFWS recommendations provided during the Section 7 consultation process. While SDCL 34A-8 does not require agency consultation for State-listed threatened and endangered species, SDGFP has been active in the preparation of this FEIS.

As discussed in **Section 4.4.3**, implementation of the Proposed Project Components are likely to cause displacement effects for greater prairie chicken and sharp-tailed grouse; however, it is difficult to estimate the level of effect because few studies have been conducted. Agricultural and other activities have fragmented grassland habitats significantly, and future energy projects are likely to increase fragmentation, thus contributing to cumulative impacts for these species. In order to better understand the impact wind development may have on these species, a grouse study plan has been developed for the Proposed Project Components (WEST 2010a). Existing leks will be monitored to determine the degree of displacement effects.

Operation of the Proposed Project Components would likely result in avian and bat mortalities (see **Sections 4.4.3.1 and 4.4.3.2**), mainly as a result of habitat fragmentation, and possible collisions with new overhead transmission lines and wind turbines. FAA-approved marker lights would be installed on turbines taller than 200 feet. Very little literature on the subject of wind turbine lighting is available. Studies have shown that tower lights may attract birds under certain weather conditions; others have shown this to be inconclusive (Manville 2009). Gehring and Kerlinger (2007) conducted a study that suggests bird fatalities resulting from the attraction of tower lights can be reduced by up to 50 to 70 percent if steady red lights are replaced with red strobe or red incandescent or white strobe lights. Given the few studies and inconclusive nature of studies relating to impacts of tower lights, tower lighting may incrementally increase cumulative effects on avian species in areas where the lights are highly concentrated, such as the edges of the Proposed Project Components.

As discussed in Sections **5.2 Past and Present Actions** and **5.3 Reasonably Foreseeable Future Actions**, there are numerous existing and proposed transmission and wind generation projects in South Dakota that have or may have similar impacts on birds and bats. However, most of these projects are located in eastern South Dakota and are considerably distant from the Proposed Project Components areas (**Figure 5.2**). Existing transmission lines and wind generation projects have negatively affected birds and bats, and, as discussed in **Sections 5.2** and **5.3**, the likely need for additional wind generation facilities and transmission capacity to meet increasing demand could increase cumulative effects in areas where these facilities are concentrated, such as eastern South Dakota. Incremental impacts associated with the Proposed Project Components may result in increased cumulative impacts when added to other wind and transmission projects near the wind facility. However, the site alternatives are geographically isolated from the majority of existing and proposed wind generation facilities (with the exception of the Wessington Springs Wind Project) and transmission lines. Therefore, bird and bat species utilizing the habitats in eastern South Dakota would not likely be incrementally impacted by the Proposed Project Components. Grassland bird use was shown to be in the normal range in the site alternatives areas; the alternatives are not high use areas based on numerous habitat factors including a relatively large amount of agricultural lands. Raptor use was shown to be low compared to other wind facilities (Derby et al 2010c and 2010d). Bat use was shown to be similar to existing wind facilities that have low mortality rates, and the same is expected for the Proposed Project Components (Derby et al. 2010a and 2010b). Therefore, bird and bat populations utilizing habitats in the local area may experience slight incremental impacts by the Proposed Project Components.

It can be assumed that as development and disturbance within the central flyway continues to increase, this would continue to degrade migratory and resident bird and bat habitat quality and quantity. Past activities that have affected habitat in the project area include conversion of native vegetation and CRP lands for farming, and construction of roads, transmission lines, and residences. Similar to the situation faced by the whooping crane, development of electrical power generation and transmission within the central flyway has contributed to a baseline condition that presents some level of risk to a bird and bat populations. Continued development of power generation and transmission (including this proposed wind facility), whether from renewable or non-renewable sources, will increase the potential for habitat fragmentation and collisions with structures.

5.4.3 CULTURAL RESOURCES

Potential impacts to cultural resources, such as prehistoric properties, historic properties, and cultural landscapes, were identified in the results of the Class III Survey and TCP Survey that were completed for the preferred alternative (Crow Lake Alternative). Agreements are being developed to ensure avoidance and/or mitigation of adverse effects to historic properties. These agreements are being developed among Western, RUS, SHPO, affected Federal agencies, Applicants, and all interested Native American Tribes. The preferred treatment of any potential TCPs and archaeological sites that are eligible for listing or remain unevaluated for the NRHP is to avoid these identified sites. Avoidance and monitoring protocol during construction will be included in an agreement. Viewshed impacts may occur on historic architectural or structural properties. Such viewshed impacts will be mitigated through a MOA in accordance with 36 CFR 800.6.

5.4.4 VISUAL

Cumulative visual impacts were assessed within the ROI described in **Section 3.8**. In response to comments received during the review of the DEIS, the visual cumulative impact analysis was expanded to include the Lewis and Clark NHT and auto tour route through North Dakota. Additional transmission line installation and wind energy development from the Proposed Project Components would incrementally increase cumulative effects on the visual landscape in the local counties caused by the addition of man-made elements to a landscape that is primarily natural or agricultural. As the number or density of tall, man-made structures increased in the local rural counties, it is possible that viewer sensitivity would also increase. The significance of the visual changes would vary according to the location of the wind project and the perceptions of the viewers. Perceptions of visual effects are highly subjective. Some people would view the turbines as relatively unobtrusive, while others would view the turbines as an obstructing addition to a landscape that may currently contain relatively little infrastructure.

Information on existing and reasonably foreseeable wind projects along the length of the Lewis and Clark NHT auto tour route is provided in **Table 5.1, Figure 5.2, Table 5.2,** and **Figure 5.3**. The build-out of all reasonably foreseeable wind projects would result in an impact to the visual landscape from the Lewis and Clark NHT auto tour route, primarily in Oliver and Burleigh counties in North Dakota where projects are clustered near the auto tour route. However, the Proposed Project Components would result in a minimal, nearly imperceptible, addition to the existing landscape (see **Section 4.8**) and would be located more than 240 miles away from Oliver and Burleigh counties in North Dakota. Areas along the Lewis and Clark NHT and auto tour route with a view of the wind facility would not likely have views of other projects identified in the cumulative analysis. The addition of the Proposed Project Components would result in a less than significant cumulative impact on the visual landscape for travelers on the Lewis and Clark NHT auto tour route.