Appendix O
Wind Energy
Reasonable Foreseeable Development Scenario

Introduction

This Reasonable Foreseeable Development (RFD) scenario for commercial wind energy development in the planning area describes existing, proposed, and potential wind farms. Specific data from a wind farm proposal in the planning area that is no longer under consideration were used for hypothetical modeling of potential future wind farms. This RFD is the basis for assessing cumulative impacts from the potential for future wind farms on BLM land.

Potential

The potential for commercial wind energy development in the planning area is based on the methods used in the Final Programmatic Environmental Impact Statement on Wind Energy Development (BLM 2005). Areas are grouped by wind power class, which is an indicator of likely resource strength, with a higher wind power class representing higher wind resource levels. Wind power classes are divided into seven classes: poor, marginal, fair, good, excellent, outstanding and superb.

The seven wind power classes are further grouped into three distinct levels: high, moderate and low potential for wind power resources (Table O.1). Included in the low potential are the poor and marginal wind power classes; the fair wind power class is included in the moderate potential; and good, excellent, outstanding and superb are grouped within the high potential category.

Table O.1
Wind Power Classes Converted to Development Potential

Wind Power Class	*Resource Potential (Utility Scale)*	*50m Wind Power Density (W/m^2)*	*Development Potential (20 Years)*	*% of Planning Area*	*% of Development Potential that is BLM Surface Ownership*
1	Poor	0-200	Low	9%	16%
2	Marginal	200-300			
3	Fair	300-400	Moderate	52%	22%
4	Good	400-500	High	39%	6%
5	Excellent	500-600			
6	Outstanding	600-800			
7	Superb	>800			

The high, moderate and low development potential areas are shown on Map O.1 (located at the end of this Appendix O) and surface ownership is delineated in Table O.2. The percentage of high potential acres managed by the BLM is 2% of the planning area; 11% of moderate potential is managed by the BLM; and 1% of low potential is managed by the BLM.

The majority of high potential acres for wind resources are located in the western third of the planning area (Glacier, Toole and Liberty Counties), which has the least amount of BLM land. Two large polygons of high potential are located in Blaine County, which includes scattered tracts of BLM land. A block of high potential acreage lies in southwest Phillips County. This block coincides with the Little Rocky Mountains, both on and off the Fort Belknap Indian Reservation and BLM land. Another large block of high potential acreage lies in northeast Valley County, which

includes only a couple of small tracts of BLM land. Very few low potential areas are managed by BLM. The remainder of the area has moderate potential for wind resources; the majority of BLM land falls within this category.

Table O.2
Land Ownership in High, Moderate and Low Development Potential Areas
(Acres)

	High	*Moderate*	*Low*	*Total*
BLM	366,000	1,841,000	235,000	2,442,000
Fish and Wildlife Service	27,000	149,000	225,000	401,000
National Park Service	182,000	42,000	149,000	373,000
Other (Private, State)	5,570,000	6,244,000	844,000	12,658,000
Total	6,145,000	8,276,000	1,453,000	15,874,000

Qualified Resource Areas

The Western Renewable Energy Zones – Phase 1 Report identified two qualified resource areas (QRAs) in the planning area (WGA and DOE 2009). Qualified resource areas represent those lands with the greatest energy density within a contiguous area. The QRAs are located in the western and central part of the planning area (Figure O.1). One of the QRAs (MT_NW) includes the Sweet Grass Hills and Kevin Rim ACECs and areas west and southwest of the ACECs. The other QRA (MT_NE) includes BLM land in the Little Rocky Mountains and areas northwest and southwest of the mountains. The QRAs include about 3,052,200 acres, of which 1,723,000 acres (56%) are within the planning area and about 31,000 acres are BLM land (1%) (Table O.3).

Table O.3
Qualified Resource Areas for Renewable Energy

Name	*Total Area (acres)*	*Planning Area (acres)*	*BLM Land (acres)*
MT_NW	2,001,870	1,092,856	15,999
MT_NE	1,050,316	630,150	15,125
Total	3,052,186	1,723,006	31,123

Operating and Proposed Wind Farms

At this time no existing or proposed wind farms are located on BLM land; however, several wind farms in varying stages of planning are located on lands not managed by the BLM. These wind farms have the potential to expand, and therefore, future wind farms and/or associated facilities (i.e., transmission lines) could occur on BLM land. Currently, renewable energy development in the proximity of the Interstate 15 corridor, where a new transmission line is being constructed to make the produced wind energy available for the power grid, is limited to wind energy development on private lands.

Operating Wind Farms

Two wind farms are located within planning area, two are operating in Montana near the planning area, and 18 are operating in Canada near the planning area (Table 0.4). The four Montana wind farms are located on private land.

Figure O.1 Qualified Resource Areas (QRA) in the Planning Area

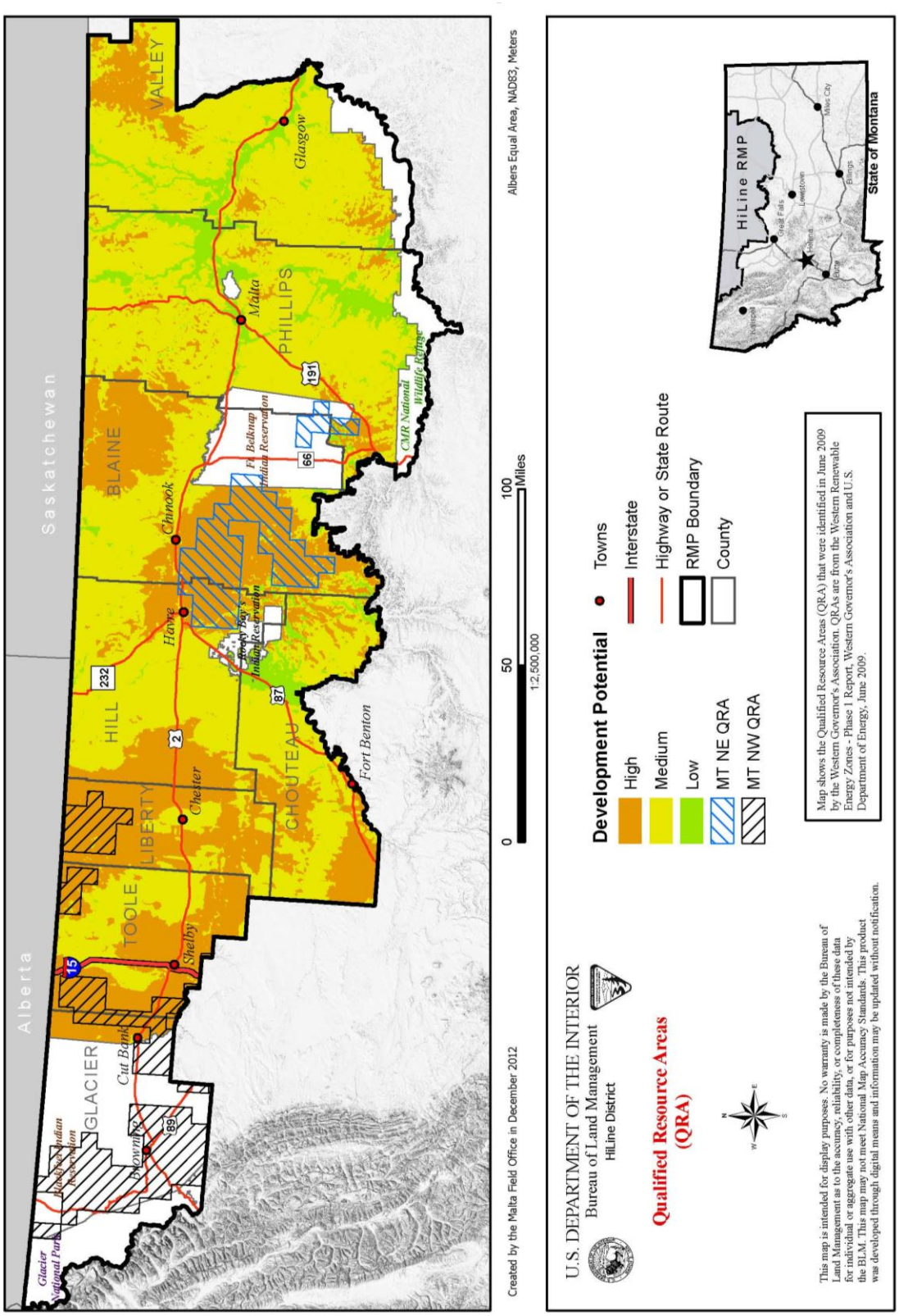

Table O.4
Operating/Under Construction Wind Farms
In and Near the HiLine Planning Area

Operating Wind Farm	*Owner*	*Location*	*No. of Turbines*	*Energy Production Per Turbine*	*Total Energy Production*	*Status*
Montana – In the HiLine Planning Area						
Glacier I	NaturEner	Near Ethridge in Toole and Glacier Counties	71	1.5 MW	106.5 MW	Operating
Glacier II	NaturEner	Near Ethridge in Toole and Glacier Counties	69	1.5 MW	103.5 MW	Operating
Rim Rock	NaturEner	Northwest of Kevin in Toole County	126	1.5 MW	189 MW	Operating
Montana – Near the HiLine Planning Area						
Bole Bench	Foundation Windpower/ WINData	Southeast of Fairfield in Teton County	4	1.6-1.7 MW	10 MW	Under Construction*
Diamond Willow Wind	MDU	South of Baker Fallon County	13	1.5 MW	20 MW	Operating
Gordon Butte	Oversight Resources	Martinsdale in Meagher County	7	1.6 MW	10 MW	Operating
Horseshoe Bend	Exergy	West of Great Falls in Cascade County	6	1.5 MW	9 MW	Operating
Judith Gap I	Invenergy	South of Judith Gap in Wheatland County	90	1.5 MW	135 MW	Operating
Judith Gap II	Invenergy	South of Judith Gap in Wheatland County	35	1.5 MW	52.5MW	Operating
Martinsdale I	Horizon Wind Energy	Near Martinsdale in Wheatland and Meagher Counties	27	2.1 MW	58 MW	Under Construction
Musselshell Wind I	Goldwind	Southeast of Harlowton in Wheatland County	7	1.5 MW	10 MW	Operating
Musselshell Wind II	Goldwind	Southeast of Harlowton in Wheatland County	7	1.5 MW	10 MW	Operating
Spion Kop	NorthWestern Energy	Near Geyser in Judith Basin County	25	1.6 MW	40 MW	Operating
Alberta, Canada – Near the HiLine Planning Area						
Blue Trail	TransAlta	Near Fort MacLeod	22	3 MW	66 MW	Operating
Castle River	TransAlta	Near Pincher Creek	59	660 kW	38.9 MW	Operating
Chin Chute	Suncor/Acciona/Enbridge	Southwest of Taber	20	1.5 MW	30 MW	Operating
Cowley Ridge	TransAlta	Near Pincher Creek	57	375 kW	21.4 MW	Operating
Cowley Ridge North	TransAlta	Near Pincher Creek	15	1,300 kW	19.5 MW	Operating
Kettle Hills I	Enmax	Near Pincher Creek	5	1.8 MW	9 MW	Operating

Table O.4
Operating/Under Construction Wind Farms
In and Near the HiLine Planning Area

Operating Wind Farm	*Owner*	*Location*	*No. of Turbines*	*Energy Production Per Turbine*	*Total Energy Production*	*Status*
Kettle Hills II	Enmax	Near Pincher Creek	30	1.8 MW	54 MW	Operating
Magrath	Suncor/Enbridge/EHN	Near Magrath	20	1.5 MW	30 MW	Operating
McBride Lake	Enmax/TransAlta	Near McBride Lake	114	660 kW	75.2 MW	Operating
Sinnott	TransAlta	Near Pincher Station	5	1,300 kW	6.5 MW	Operating
Soderglen	Nexen/TransAlta	Near Fort McLeod	47	1.5 MW	70.5 MW	Operating
Summerview	TransAlta	Near Pincher Creek	38	1.8 MW	68.4 MW	Operating
Summerview 2	TransAlta	Near Pincher Creek	22	3 MW	66 MW	Operating
Taber	Enmax	Near Taber	37	2.2 MW	81.4 MW	Operating
Taylor	TransAlta	Near Magrath	9	375 kW	3.38 MW	Operating
Saskatchewan, Canada – Near the HiLine Planning Area						
Centennial	SaskPower International	Near Swift Current	83	1.8 MW	149.4 MW	Operating
Cypress	SaskPower International	Near Gull Lake	16	660 kW	10.6 MW	Operating
Sunbridge	Suncor/Enbridge	Near Swift Current	17	660 kW	11.2 MW	Operating

* Construction begun as of March 13, 2014.

Proposed Wind Farms

Three wind farms are proposed to be built on private land near the planning area (Table O.5). More than a dozen potential wind farms located on private or state land are in the initial phases of testing, but no proposal has been submitted for permitting.

Reasonable Foreseeable Development Scenario

In addition to the methodology described above for determining high, moderate and low development potential areas, the BLM previously analyzed the proposed Valley County Wind Farm, which was dropped from consideration, for the hypothetical modeling of potential future wind farms on BLM land (BLM 2006). The Valley County Wind Farm was initially proposed as a 33 turbine wind farm, 1.5 MW each and capable of producing 50 MW of energy. The development proposal grew in scale to include three more phases, each increasing the amount of turbines and energy capacity resulting in a four-phase, 334 turbine wind farm capable of producing 500 MW of energy. The Valley County Wind Farm was proposed initially on private land immediately south of the Bitter Creek Wilderness Study Area (WSA). However, later phases and the approximately 30 mile transmission line would have been located on BLM land. Table O.6 shows the projected temporary and permanent ground disturbance acreage for each phase of the Valley County Wind Farm development.

Hypothetical Wind Farms

To determine the reasonable foreseeable commercial wind energy development scenario for the planning area, two types of wind farms were hypothetically described. Table O.7 shows two hypothetical wind farms, one small and one large that are somewhat representative of potential future development. These two wind farms are based on the Phase II and Phase IV proposals of the Valley County Wind Farm. It is assumed that the two wind farms would be located in high or moderate development potential areas for wind resources.

In addition to turbines, it is expected that collector substations, collector systems, new access roads, internal road networks, turbine string turnaround areas, turbine foundations, pad-mounted transformers, material staging areas and operations and maintenance buildings would be included in a wind farm proposal as associated facilities.

A small wind farm is expected to utilize 2,800 acres of land as a general "footprint" for construction staging areas, turbines, and associated facilities. These associated facilities are assumed to create 200 acres of short-term surface disturbance and 48 acres of long-term surface disturbance (post reclamation) for a small wind farm proposal.

A large wind farm is expected to utilize 10,706 acres for construction staging areas, turbines, and associated facilities. The acres of surface disturbance for a large wind farm would be 727 acres of short-term surface disturbance and 183 acres of long-term surface disturbance (post reclamation).

The associated transmission lines may or may not be sited on BLM land. This would depend on the location of the wind farm to existing transmission lines. Two transmission lines (Highway 89 and Highway 2) are capable of transporting power to the grid within the planning area. Because of the expense associated with transmission lines, it is assumed that siting of potential wind farms would be near existing lines rather than far from existing lines, which would require new transmission lines.

The increased need for energy and reducing American reliance on foreign energy resources will most likely increase the demand for wind farms. If that trend continues the hypothetical model for either small or large wind farms could occur.

Table O.5
Proposed/Approved Wind Farms in Montana Near the HiLine Planning Area

Proposed Wind Farm	*Owner*	*Location*	*No. of Turbines*	*Energy Production Per Turbine*	*Total Energy Production*	*Status*
Big Otter	Invenergy	Near Belt in Cascade County	16	1.5 MW	24 MW	Proposed*
Coyote Wind	Enerfin Energy	Southwest of Big Timber in Sweet Grass County	44	1.8 MW	80 MW	Approved
Two Dot Wind	NJR Clean Energy Ventures	Near Two Dot in Wheatland County	6	1.6 MW	9.7 MW	Approved

* In December 2010 the Cascade County Zoning Board granted Invenergy a special use permit to begin construction of the Big Otter wind farm within 18 months.

Table O.6
Valley County Wind Farm
Temporary and Permanent Ground Disturbance by Wind Farm Phase

	Phase I			*Phase II*			*Phase III*			*Phase IV*			*Full Build-Out*		
Number of Turbines	33			63			104			134			334		
Acres	1,094			2,800			5,520			10,706			20,120		
Power Generated (MW)	50			100			150			200			500		
	Acres of Disturbance														
	Temp.	*Perm.*	*Subtotal*	*Temp.*	*Perm.*	*Subtotal*	*Temp.*	*Perm.*	*Subtotal*	*Temp.*	*Perm.*	*Subtotal*	*Temp.*	*Perm.*	*Subtotal*
O&M Buildings	2	2	4	0	0	0	0	0	0	0	0	0	2	2	4
Collector Substation	1	2	3	0	0	0	0	0	0	0	0	0	1	2	3
Collector System	6.8	0	6.8	10.8	0	10.8	22.4	0	22.4	41.6	0	41.6	81.6	0	81.6
New Access Road	8.7	5.8	14.5	0	0	0	0	0	0	0	0	0	8.7	5.8	14.5
Internal Road Network	8	14.4	22.4	12.7	22.9	35.6	25.2	45.4	70.6	49	88.1	137.1	94.9	170.8	265.7
Turbine String Turnaround Area	0.8	0	0.8	5.2	0	5.2	4.4	0	4.4	11.6	0	11.6	22	0	22
Wind Turbine Foundations	0	0.1	0.1	0	0.2	0.2	0	0.3	0.3	0	0.4	0.4	0	1	1
Pad-Mounted Transformers	0	0.1	0.1	0	0.2	0.2	0	0.3	0.3	0	0.4	0.4	0	1	1
Turbine Work Areas/ Material Staging	33	0	33	63	0	63	104	0	104	134	0	134	334	0	334
Total Acres	60.3	24.4	84.7	91.7	23.3	115	156	46	202	236.2	88.9	325.1	544.2	192.6	726.8

Source: Valley County Wind Energy Project Public Review EA, June 2006

Table O.7
Small and Large Hypothetical Models and Associated Facilities
(Not Including Potential Transmission Lines)

	Small			***Large***		
Number of Turbines	63			134		
Overall Area (acres)	2,800			10,706		
Power Generated (MW)	100			200		
	Surface Disturbance (Acres)			***Surface Disturbance (Acres)***		
	Short-Term	***Long-Term***	***Reclaim***	***Short-Term***	***Long-Term***	***Reclaim***
Operation and Maintenance Buildings	4	2	2	4	2	2
Collector Substation	3	1	2	3	1	2
Collector System	11	0	11	82	0	82
New Access Road	15	9	6	15	9	6
Internal Road Network	36	23	13	266	171	95
Turbine String Turnaround Area	5	0	5	22	0	22
Wind Turbine Foundations	0.2	0.2	0	1	1	0
Pad-Mounted Transformers	0.2	0.2	0	1	1	0
Turbine Work Areas/Material Staging	63	0	63	334	0	334
Total	133	33	100	724	183	541

Alberta

Saskatchewan

Glacier National Park

Blackfeet Indian Reservation

GLACIER

Cut Bank

Browning

Shelby

TOOLE

LIBERTY

HILL

BLAINE

Chester

Havre

Chinook

VALLEY

Rocky Boy's Indian Reservation

Ft. Belknap Indian Reservation

Malta

Glasgow

PHILLIPS

CHOUTEAU

Fort Benton

CMR National Wildlife Refuge

Created by the Malta Field Office in December 2012

0 25 50 100 Miles

1:1,500,000

Albers Equal Area, NAD83, Meters

U.S. DEPARTMENT OF THE INTERIOR

Bureau of Land Management

HiLine District Office

Map O.1

Wind Energy
Development Potentials

Map shows the Development Potential for Wind Energy. Development Potentials are based on Wind Power Classifications.

Development Potential

- High
- Moderate
- Low
- Not Analyzed

- RMP Boundary
- County
- Interstate
- Highway or State Route
- Town

N W E S