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January 28, 2022

Via Electronic Filing

Mr. Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101

Re: ***In the Matter of the Application of Buffalo Ridge Wind, LLC for a Site Permit for the 109 MW Large Wind Energy Conversion System in Lincoln and Pipestone Counties, Minnesota*, Docket No. IP-7006/WS-19-394**

Request to Amend Site Permit of Buffalo Ridge Wind, LLC

Dear Mr. Seuffert:

Pursuant to Minn. R. 7854.1300, Subp. 2, Buffalo Ridge Wind, LLC ("BRW") respectfully submits this request that the Commission amend the Site Permit issued to BRW on January 5, 2021 ("Amendment Request") for good cause shown. BRW is seeking to amend the Site Permit to reflect (1) a change in turbine technology, (2) a change in the location of the Project collector substation; and (3) the addition of a short (less than 1,500 feet in length) 115 kilovolt (kV) generation-tie line resulting from the relocation of the collector substation.

As explained in the Amendment Request, the change in turbine technology is necessitated by desire to ensure that the Project is able to capture tax benefits provided by the federal Production Tax Credit ("PTC") and to be flexible as changes to the PTC are being contemplated in Congress. Importantly, the locations permitted for turbine siting are not changing. The collector substation is being moved due to a change in site control of the substation land originally proposed. The substation relocation now requires an approximately 1,370-foot-long 115 kV gen-tie line to interconnect the Project to the transmission system. Importantly, these requested minor changes to the Site Permit will not materially impact the human or natural environment, nor do such changes impact the basis upon which the Commission made its original decision to grant a Site Permit for the Project.

BRW respectfully requests that the Commission approve this Amendment Request by April 1, 2022 to align with BRW's plans to begin construction of the Project in June 2022. (BRW executed a provisional generation interconnection agreement with the Midcontinent Independent System Operator, Inc. in September 2021.) Because the requested changes to the Site Permit are minor, the Amendment Request can be appropriately reviewed through a notice and comment process.

Thank you for your attention to this filing. Please feel free to contact me with any questions regarding this Amendment Request.

Respectfully submitted,

/s/ Brian M. Meloy

Brian M. Meloy

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

In the Matter of the Application of Buffalo Ridge Wind, LLC for a Site Permit for the 109 MW Large Wind Energy Conversion System in Lincoln and Pipestone Counties, Minnesota	)))))	**Docket No. IP-7006/WS-19-394** **CERTIFICATE OF SERVICE**

The undersigned hereby certifies that a true and correct copy of **Buffalo Ridge Wind, LLC's Request to Amend Site Permit,** has been served today by e-mail and/or U.S. Mail to the following:

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Dated this 28th day of January, 2022

/s/ Joshua M. Feit
Joshua M. Feit

Buffalo Ridge Wind, LLC's Request to Amend Site Permit

Buffalo Ridge Wind Project

Lincoln County and Pipestone County, Minnesota

Docket No. IP-70061/WS-19-394

January 28, 2022

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ATTACHMENTS

Introduction

On January 5, 2021, the Minnesota Public Utilities Commission (Commission) issued a Site Permit to Buffalo Ridge Wind, LLC (BRW), pursuant to Minnesota Statutes Chapter 216 F and Minnesota Rules Chapter 7854. Section 1 of the Site Permit authorizes BRW to construct and operate the Buffalo Ridge Wind Project, an up to 108.7-megawatt (MW) nameplate capacity Large Wind Energy Conversion System and associated facilities in Lincoln and Pipestone County, Minnesota (the Project). As BRW has continued to develop the Project, BRW has determined that it needs to amend the Site Permit pursuant to Minn. R. 7854.1300 to: (1) update the turbine technology; (2) change the location of the collector substation; and (3) include a short 115 kilovolt (kV) generation-tie line (gen-tie line). As explained herein, there is good cause to amend the Site Permit and the amendments are minor and would not adversely impact the human or natural environment.

Turbine Technology

Section 2 of the Site Permit approved a total of 45 wind turbine sites (40 proposed wind turbine sites, plus 5 alternate sites) for a capacity of 108.7 MW. A maximum of 40 turbines were proposed for construction, and it was anticipated that the Project would use 36 General Electric (GE) 2.82 MW wind turbine generators (WTG) and 4 GE 2.52 MW WTGs. Five alternate sites were included to provide flexibility in the event constructability issues were encountered.

BRW now proposes to use one of two array turbine options, herein referred to as Option A and Option B. For both options, all turbine site locations remain the same as permitted in the Site Permit, except that Primary Turbine Site 31 has been dropped, and Alternative Turbine Site 3 (Alt 3) will be used instead. BRW will still construct a total of 40 turbines. The remaining four alternate sites are included to provide flexibility in the event constructability issues are encountered. The reason for the changes set forth in Options A and B is due to uncertainty regarding U.S. tax reform. Draft tax reform will change the manner in which Production Tax Credits are structured for wind projects. Therefore, Option A would be implemented if no tax reform is implemented, and Option B would be implemented if new tax reform is enacted in a form similar to that currently being considered in Congress. BRW would implement either Option A or B at the time of submitting the Site Plan required in Section 10.3 of the Site Permit.

- Option A: The turbine technology would remain the same as permitted in the Site Permit, with the following changes: the proposed construction of 36 GE 2.82 MW WTGs and 4 GE 2.52 MW WTGs. If the alternative sites are used, the wind turbine technology will be the same: 36 GE 2.82 MW WTGs and 4 GE 2.52 MW WTGs. The total capacity under Option A will be up to 106 MW.

- Option B: The turbine technology would remain the same as permitted in the Site Permit for the proposed construction of the first 36 GE 2.82 MW WTGs, with a turbine technology change to 4 GE 2.32 MW WTGs for the last four wind turbines proposed for construction. If the alternative sites are used, the wind turbine technology will be the same: 36 GE 2.82 MW WTGs and 4 GE 2.32 MW WTGs. The total capacity under Option B will be up to 106 MW.

Collection Substation Location Change and Generation-Tie Line

Section 2 of the Site Permit indicated that the project collector substation would connect to the existing Buffalo Ridge Substation via a 115 kV transmission jumper (less than 1,500 feet in length) that would cross existing transmission lines owned by Northern States Power Company (NSP). The proposed location of the project collection substation has now changed due to a change in site control of the substation land originally proposed. As such, the new location of the collector substation necessitates an approximately 1,370-foot-long 115 kV gen-tie line. **See Map 2, Attachment A: Project Area and Facilities and Attachment H**: **Detail of Proposed Substation and Generation Tie Line Location**. **Attachment H** shows the former and proposed location of the collector substation, representative transmission structures, and photographs.

BRW has proposed changes to the issued Site Permit are set forth below in the section entitled: **Site Permit Requested Changes**.

Additional Supporting Materials

The above-described changes to the turbine technology and relocation of the collector substation with the addition of a short gen-tie line have either no impacts or minor impacts because site turbine locations have not changed, the rotor diameter (RD) of the turbines are the same, and the relocation of the collector substation and the addition of a gen-tie line is over a short distance and impacts the same type of land as the original location. To facilitate the review of the proposed Site Permit Amendment, BRW compares sections of the Application, as amended during the proceeding, to the proposed changes, all of which show that BRW's changes are in compliance with applicable Site Permit conditions and are supported by studies and supplemental information.

Maps to support this amendment request are provided as **Attachment A**. Details regarding the relationship of residences (receptors) to proposed wind turbine locations are provided as **Attachment B**. **Attachments C** and **D** include the results of a Pre-construction Sound Analysis for Options A and B, respectively. **Attachments E** and **F** include the results of a Shadow Flicker Analysis for Options A and B, respectively. A revised Decommissioning Plan and Decommissioning Cost Estimate that incorporates the gen-tie line is included as **Attachment G**. A proposed typical pole structure for the gen-tie line, a figure showing the location of the current proposed collection substation and gen-tie line in relation to the previously proposed substation location, and a general arrangement plan, profile, and representative photographs of the collector substation are included in **Attachment H**. The Electromagnetic Interference Analysis provided previously in Appendix E of the Application remains valid for Options A and B, and, thus, a revised Electromagnetic Interference Analysis study is not provided. Maps (**Attachment A**), the Pre-construction Sound Analysis (**Attachments C** and **D**), and the Shadow Flicker Analysis (**Attachments E** and **F**) show 39 primary turbines and 5 alternative turbines because Turbine 31 was dropped; however, as discussed above, the Project will construct a total of 40 turbines as alternative site turbine location Alt 3 will be used. The Pre-construction Sound and Shadow Flicker

Analyses were conducted for all 44 turbines (primary and alternate site locations) that are currently proposed to provide conservative results supporting the construction of any of the alternative site locations if a primary is dropped due to constructability issues.

Section 4.3 – Rated Capacity

The Site Permit was issued for a rated capacity of up to approximately 108.9 MW for the Project. Under Option A, the rated capacity would be up to 106 MW. Under Option B, the rated capacity would be up to 106 MW.

Section 4.4 – Number of Turbine Sites

The Site Permit was issued for a total of 40 primary turbine locations and 5 alternative turbine locations comprising 36 primary and 3 alternative GE 2.82 MW turbines and 4 primary and 2 alternative GE 2.52 MW turbines. The locations of the primary and alternative turbine sites have not changed and will be the same under Option A or Option B as shown in **Attachment A**, **Map 2: Project Area and Facilities**, with the understanding that the primary site location for Turbine 31 has been dropped and replaced with alternative turbine site location Alt 3. Therefore, 4 alternative turbine site locations remain from the original 5 permitted under the issued Site Permit. A summary of the turbine technology approved in the Site Permit and proposed under Option A and Option B is provided in **Table 2**.

Table 2: Wind Turbine Technology

Turbine Type	Number and Turbine Type in Site Permit (Primary/Alternative)	Option A (Primary/Alternative)	Option B (Primary/Alternative)
GE 2.82 MW Turbine	36/3	36/3	36/3
GE 2.52 MW Turbine	4/2	4/1	0/0
GE 2.32 MW Turbine	0/0	0/0	4/1
TOTAL	40/5	40/4	40/4

Section 4.6 – Percent of Wind Rights Secured

As a general update, approximately 99% of land control agreements necessary for construction and operation of the Project are in place. The remaining agreement will be in place prior to the submittal of the Site Plan.

Section 5.1 – Description of Project Layout

The issued Site Permit allows for the use of 36 GE 2.82 MW turbines and 4 GE 2.52 MW turbines. The Applicant proposes to now use 36 GE 2.82 MW turbines and 4 GE 2.52 MW turbines (Option A) or 36 GE 2.82 turbines and 4 GE 2.32 MW turbines (Option B). All turbines will be set back at least 3 RD in non-prevailing wind directions and 5 RD in prevailing wind directions from

properties not participating in the Project. Based on the dimensions of the turbines associated with the Site Permit Amendment, the GE 2.82 MW turbines used in both options will be set back at least 1,252 feet (381.6 meters) (3 RD) in non-prevailing wind directions from properties not participating in the Project and at least 2,087 feet (636 meters) (5 RD) in prevailing wind directions from properties not participating in the Project. The GE 2.52 MW turbines (Option A) and the GE 2.32 MW turbines (Option B) have the same RD. Therefore, they will both be set back at least 1,147 feet (349.5 meters) (3 RD) in non-prevailing wind directions from properties not participating in the Project and at least 1,911 feet (582.5 meters) (5 RD) in prevailing wind directions from properties not participating in the Project. **Attachment A**, **Map 3: Turbine Layout and Constraints** shows the revised layout and applicable setbacks.

Section 5.2 – Description of Turbines and Towers

Not related to the proposed changes set forth in this proposed amendment, a minor change is needed to Section 4.9 of the Site Permit to correct the description of the GE 2.52 WTG to include the following design features: 116.5-meter (382-foot) RD and a 90-meter (295-foot) hub height. As written, Section 4.9 used the design features for the GE 2.82 for the GE 2.52, and BRW proposes this minor change be made in the amended Site Permit.

Additionally, for supplemental informational purposes, under Option A, the proposed turbine models are the same as those permitted in the issued Site Permit. Under Option B, the same GE 2.82 MW turbines approved in the Site Permit would be used, but a GE 2.32 MW turbine with 116.5-meter (382-foot) RD and 80-meter (262-foot) hub height towers would be used instead of the previously permitted GE 2.52 MW turbines. Characteristics of the GE 2.82 MW, GE 2.52 MW, and GE 2.32 MW turbine models are summarized in **Table 5.2** below.

Table 5.2: Wind Turbine Characteristics

Design Features	GE 2.82 MW Turbine (Proposed for both Options A and B)	GE 2.52 MW Turbine (Proposed for Option A)	GE 2.32 MW Turbine (Proposed for Option B)
Nameplate Capacity	2.82 MW	2.52 MW	2.32 MW
Hub Height	89 meters (292 feet)	90 meters (295 feet)	80 meters (262 feet)
Rotor Swept Area	12,704 meters^2 (136,745 square feet)	10,660 meters^2 (114,743 square feet)	10,660 meters^2 (114,743 square feet)
Total Height (ground to fully extended blade tip)	152.1 meters (499 feet)	148.3 meters (487 feet)	138.3 meters (454 feet)
Rotor Diameter	127.2 meters (417 feet)	116.5 meters (382 feet)	116.5 meters (382 feet)
Cut in Wind Speed	3 meters per second (m/s) (6.8 miles per hour (mph))	3 m/s (6.8 mph)	3 m/s (6.8 mph)
IEC Wind Class	7.85 m/s (17.6 mph)	7.0 m/s (15.7 mph)	7.0 m/s (15.7 mph)

Design Features	GE 2.82 MW Turbine (Proposed for both Options A and B)	GE 2.52 MW Turbine (Proposed for Option A)	GE 2.32 MW Turbine (Proposed for Option B)
Cut-Out Wind Speed	30 m/s (66.8 mph) in 600 second time interval	32 m/s (71.6 mph) in 600 second time interval	32 m/s (71.6 mph) in 600 second time interval
Rotor Speed	7.4–15.7 revolutions per minute (RPM)	7.4–15.7 RPM	7.4–15.7 RPM
Tip Speed	85.1–89.1 m/s (190.4–199.3 mph)	81.7–85.4 m/s (182.8–191.0 mph)	81.7–85.4 m/s (182.8–191.0 mph)
Sound at Turbine	95.2–108.5 dBA	93.5–106.0 dBA	93.5–106.0 dBA
Power Regulation	Blade pitch controls power; controls included for zero voltage ride through (ZVRT) and enhanced reactive power (0.9 power factor)	Blade pitch controls power; controls included for ZVRT and enhanced reactive power (0.9 power factor)	Blade pitch controls power; controls included for ZVRT and enhanced reactive power (0.9 power factor)
Generation	2.82 MW per turbine	2.52 MW per turbine	2.32 MW per turbine
Tower	Multi-coated, conical tubular steel with safety ladder to the nacelle; rest platforms each section	Multi-coated, conical tubular steel with safety ladder to the nacelle; rest platforms each section	Multi-coated, conical tubular steel with safety ladder to the nacelle; rest platforms each section
Supervisory Control and Data Acquisition (SCADA)	Each turbine equipped with SCADA controller hardware, software, and database storage capability	Each turbine equipped with SCADA controller hardware, software, and database storage capability	Each turbine equipped with SCADA controller hardware, software, and database storage capability
Federal Aviation Administration (FAA) Lighting	Yes, per FAA permitting	Yes, per FAA permitting	Yes, per FAA permitting
Foundation	Per manufacturer specifications—spread foot or pier foundation, as appropriate	Per manufacturer specifications—spread foot or pier foundation, as appropriate.	Per manufacturer specifications—spread foot or pier foundation, as appropriate.

Source: GE manufacturer specifications

Section 5.3.3. – Collector Substation and Interconnection and Section 6.1. – Transmission and Project Substation

BRW executed a provisional generation interconnection agreement with the Midcontinent Independent System Operator, Inc. in September 2021. For both Option A and Option B, BRW proposes to construct an approximately 1,370-foot-long 115 kV gen-tie line to connect the BRW collector substation to the existing Buffalo Ridge Substation owned by NSP, which is the point of interconnection. **See Map 2, Attachment A: Project Area and Facilities** and **Attachment H: Detail of Proposed Substation and Generation Tie Line**. **Attachment H** also includes a general arrangement plan, profiles, and a representative photograph for the collector substation. Up to four steel poles will be constructed to support the overhead gen-tie with an average span between structures ranging from 400 to 550 feet. The gen-tie line design will use dead-end type structures

ranging from 100 to 120 feet above the ground surface. A proposed typical transmission pole structure is shown in **Attachment H**. The proposed 115 kV gen-tie line will be designed to meet all applicable local and state codes, the North American Electric Reliability Corporation Reliability Standards, and the National Electric Safety Code.

Section 7.0 Wind Rights

BRW has secured 99% of site control agreements needed for wind rights to operate the Project. The remaining agreement will be in place prior to the submittal of the Site Plan.

Section 8.3 – Sound

Section 8.3.1 – Description of Resources

The sound analysis for the Application included a total of 45 project-related wind turbines (40 primary + 5 alternatives), of which 6 were proposed to be GE 2.52 wind turbines and 39 were proposed to be GE 2.82 wind turbines. Select GE 2.82 wind turbines (Turbines 8, 17, 19, 20, 21, 29, 33, 36, 38, and Alt 5) were proposed to run under a noise reduced operation (NRO). All wind turbines were proposed to have low-noise trailing edge (LNTE) blades. The Pre-construction Sound Analyses for Option A and Option B below show 39 primary turbine site locations and 5 alternative turbine site locations, with the understanding that primary site location Turbine 31 has been dropped and alterative site location Alt 3 will replace Turbine 31. Therefore, BRW will construct a total of 40 turbines. The Pre-construction Sound Analyses were conducted for all 44 turbines (primary and alternate turbine locations) that are currently proposed. As discussed below, the Sound Analyses show that the changes do not materially impact the results previously reviewed by the Commission.

Option A

The sound analysis for Option A includes a total of 44 project-related wind turbines of which 39 are proposed to be GE 2.82 wind turbines and 5 are proposed to be GE 2.52 wind turbines. Select GE 2.82 wind turbines (Turbines 8, 13, 17, 19, 20, 21, 29, 33, 36, 38, and Alt 5) are modeled to run under an NRO, and all wind turbines are proposed to have LNTE blades.

Option B

The sound analysis for Option B includes a total of 44 project-related wind turbines of which 39 are proposed to be GE 2.82 wind turbines and 5 are proposed to be GE 2.32 wind turbines. Select GE 2.82 wind turbines (Turbines 8, 13, 17, 19, 20, 21, 29, 33, 36, 38, and Alt 5) are modeled to run under an NRO, and all wind turbines are proposed to have LNTE blades.

Section 8.3.2 – Potential Impacts

In the sound analysis conducted for the Application, the highest predicted worst-case Project Only L_{50} sound level at a modeling receptor was 47 A-weighted decibels (dBA), which occurred at 19

participating receptors. The highest modeled Project Only L_{50} sound level at a non-participating receptor was 45 dBA (receptors 154, 83, and 16). The highest modeled L_{50} sound level from the Project + existing Non-Project (*i.e.*, Ruthton Wind Turbines[1]) + Future Non-Project (*i.e.*, Lake Benton Wind II) scenario was 52 dBA and occurred at one participating location (receptor 44). The second highest modeled L_{50} sound level from the Project + Ruthton Wind Turbines + Lake Benton Wind II scenario was 48 dBA and occurred at two locations: non-participating receptor 42 and participating receptor 64. Since the time of the original sound analysis, Lake Benton Wind II has been constructed and has entered operation. For the updated sound analysis results, Lake Benton Wind II is referred to under Non-Project sound together with Ruthton Wind.

Option A

A sound analysis conducted for Option A (**Attachment C**; **Maps 7, 8a, 9a, 10a, 11a, 12a, and 12b.1** in **Attachment A**) determined that the highest predicted worst-case Project Only L_{50} sound level at a modeling receptor is 47 dBA and is modeled to occur at 12 participating receptors (receptors 138, 141, 85, 841, 93, 92, 89, 46, 71, 55, 151, and 91). The highest modeled Project Only L_{50} sound level at a non-participating receptor is 45 dBA (at receptor 154). The highest modeled L_{50} sound level from the Project + Non-Project (i.e., Ruthton Wind Turbines and Lake Benton Wind II) scenario is 52 dBA and is modeled to occur at one participating location (receptor 44). Receptor 44 is less than 600 feet from a Ruthton wind turbine. As shown in Table D-3 of the sound analysis report (**Attachment C**), the Ruthton Only sound level at receptor 44 is 51 dBA. The Project Only sound level at this receptor is 39 dBA, shown in Table D-2A of the sound analysis report. The Project contributes to the modeled Project + Ruthton + Lake Benton Wind II sound level at this receptor by no more than 1 dBA, which is an imperceptible change in the sound level. The second highest modeled L_{50} sound level from the Project + Ruthton + Lake Benton Wind II scenario is 48 dBA and is modeled to occur at non-participating receptor 42.

Table 8.3.2a presents a summary of the Option A sound level modeling results for each modeling scenario including a Project Only scenario, a Ruthton Only scenario, and a Project + Ruthton + Lake Benton Wind II scenario.

Table 8.3.2a: Summary of Sound Assessment (Option A)

Modeling Scenario	Maximum Modeled L_{50} Sound Pressure Level (dBA) at NAC 1 Receptors		
	All Receptors	Participating	Non-Participating
Project Only	47	47	45
Ruthton Only	51	51	48
Project + Ruthton + Lake Benton Wind II	52	52	48

[1] [1] These existing turbines are Vestas V47-660s. They may be owned by separate LLCs but are generally referred herein as "Ruthton Wind Turbines" or "Ruthton".

Option B

A sound analysis conducted for Option B (**Attachment D; Maps 7, 8b, 9b, 10b, 11b, 12b,** and **12b.2** in **Attachment A**) determined that the highest predicted worst-case Project Only L_{50} sound level at a modeling receptor is 47 dBA and is modeled to occur at 12 participating receptors (receptors 138, 141, 85, 841, 93, 92, 89, 46, 71, 55, 151, and 91). The highest modeled Project Only L_{50} sound level at a non-participating receptor is 45 dBA (at receptor 154). The highest modeled L_{50} sound level from the Project + Non-Project (*i.e.*, Ruthton Wind Turbines and Lake Benton Wind II) scenario is 52 dBA and is modeled to occur at one participating location (receptor 44). The second highest modeled L_{50} sound level from the Project + Ruthton + Lake Benton Wind II scenario is 48 dBA and is modeled to occur at non-participating receptor 42.

Table 8.3.2b presents a revised summary of the sound level modeling results for each modeling scenario including a Project Only scenario, a Ruthton Only scenario, and a Project + Ruthton + Lake Benton Wind II scenario.

Table 8.3.2b: Summary of Sound Assessment (Option B)

Modeling Scenario	Maximum Modeled L_{50} Sound Pressure Level (dBA) at NAC 1 Receptors		
	All Receptors	Participating	Non-Participating
Project Only	47	47	45
Ruthton Only	51	51	48
Project + Ruthton + Lake Benton Wind II	52	52	48

Section 8.3.3 – Mitigation Measures

BRW has designed the Project to meet the Minnesota Pollution Control Agency (MPCA) state noise standards and to minimize the sound levels due to the wind turbines at the homes in the community as much as possible, while also meeting the other project design constraints, including the 3 RD/5 RD setbacks previously described, and other regulatory requirements.

BRW now proposes using GE 2.82 MW turbines and either GE 2.52 MW turbines (Option A) or GE 2.32 MW turbines (Option B). Compliance with MPCA noise standards will be accomplished, in part, by equipping all turbine blades with LNTE, employing NRO at select turbine locations as detailed in **Section 8.3.1** above, and including a 1,400-foot setback from residences in BRW's design. Also, consistent with the 3 RD by 5 RD large wind energy conversion system setback requirement, GE 2.82 MW turbines will be set back at least 1,252 feet (381.6 meters) (3 RD) in non-prevailing wind directions from properties not participating in the Project and at least 2,087 feet (636 meters) (5 RD) in prevailing wind directions from properties not participating in the Project. The GE 2.52 MW (Option A) and GE 2.32 MW (Option B) turbines will be set back at

least 1,147 feet (349.5 meters) (3 RD) in non-prevailing wind directions from properties not participating in the Project and at least 1,911 feet (582.5 meters) (5 RD) in prevailing wind directions from properties not participating in the Project.

Section 8.4 – Visual Impacts

Section 8.4.2 – Visual Impacts

For the Application, BRW proposed using 36 GE 2.82 MW turbines with a total height of 152.1 meters and 4 GE 2.52 MW turbines with a total height of 148.3 meters.

Option A

Changes in visual impacts are immaterial under Option A. **Table 8.4.2a** has been updated to reflect Option A technology.

Table 8.4.2a: Rotor Diameter and Number of Turbines (Option A)

Turbine Model	Hub Height (meters/feet)	Rotor Diameter (meters/feet)	Rotor Tip Height (meters/feet)	Ground Clearance (meters/feet)	Number of Turbines	Number of Alternative Turbines
GE 2.52 MW	90/295	116.5/382.2	148.3/487	32/105	4	1
GE 2.82 MW	89/292	127.2/417.3	152.1/499	25/82	36	3

The addition of the proposed gen-tie line would alter the visual appearance within the vicinity of the gen-tie by adding additional vertical and horizontal artificial structures to the existing landscape. The gen-tie will not create a new feature type within the landscape as multiple existing overhead lines are present at the existing Buffalo Ridge Substation.

Option B

The GE 2.32 MW turbines have a total height of 138.3 meters (454 feet), which is 10 meters shorter than the previously permitted GE 2.52 MW turbines. Changes in visual impacts are immaterial. **Table 8.4.2b** has been updated to reflect Option B turbine technology.

Table 8.4.2b: Rotor Diameter and Number of Turbines (Option B)

Turbine Model	Hub Height (meters/feet)	Rotor Diameter (meters/feet)	Rotor Tip Height (meters/feet)	Ground Clearance (meters/feet)	Number of Turbines	Number of Alternative Turbines
GE 2.32 MW	80/262	116.5/382.2	138.3/454	22/105	4	1
GE 2.82 MW	89/292	127.2/417.3	152.1/499	25/82	36	3

The addition of the proposed gen-tie line would alter the visual appearance within the vicinity of the gen-tie line by adding additional vertical and horizontal artificial structures to the existing landscape. The gen-tie line will not create a new feature type within the landscape as existing overhead lines are present at the existing Buffalo Ridge Substation.

Section 8.4.3 – Shadow Flicker

The analysis for the Application indicated that the modeled worst-case annual shadow flicker duration ranged between 0 hours, 0 minutes and 124 hours, 30 minutes per year, which occurred at participating receptor 841. The maximum modeled worst-case annual flicker at a non-participating receptor (receptor 154) was 83 hours, 0 minutes.

The shadow flicker analysis for the Application indicated that the maximum predicted expected annual shadow flicker duration was 42 hours, 11 minutes per year, which occurred at participating receptor 841. The maximum predicted, expected annual flicker at a non-participating receptor (receptor 154) was 28 hours, 51 minutes.

The Application analysis also indicated that 295 receptors were predicted to experience no annual shadow flicker, 67 locations were predicted to experience less than 10 hours per year of shadow flicker, 40 locations were expected to have between 10 and 30 hours of shadow flicker per year, and 9 locations were expected to have more than 30 hours of shadow flicker per year. None of the receptors expected to have more than 30 hours of shadow flicker per year were non-participating receptors. As discussed herein, the Shadow Flicker Analyses for Option A and Option B below show 39 primary turbines and 5 alternative turbines, because primary Turbine 31 was dropped. However, Alt 3 will be activated as a primary turbine to replace Turbine 31; thus, the Project will construct a total of 40 turbines. The Shadow Flicker Analyses were conducted for all 44 turbines (primaries and alternates) that are currently proposed. The analyses for Options A and B used RDs of 127.2 m for GE 2.82 MW turbines and 116.5 m for GE 2.52 MW and 2.32 MW turbines, based on specifications from the manufacturer, instead of the previously modeled 127.0 m and 116.0 m RDs. This resulted in minor changes to the results detailed below.

Option A

An analysis for Option A (**Maps 15a** and **16a** in **Attachment A**) indicates that the worst-case annual shadow flicker duration increases to 125 hours, 12 minutes and is at participating receptor 841. The maximum modeled worst-case annual flicker at a non-participating receptor (receptor 154) is 83 hours, 15 minutes, which is a 15-minute increase from the 83 hours, 0 minutes at non-participating receptor 154 indicated during the proceeding.

The maximum predicted expected annual shadow flicker duration for Option A is now 42 hours and 26 minutes (at participating receptor 841). This is an increase of 15 minutes compared to the analysis for the Application. The maximum predicted expected annual flicker at a non-participating receptor (receptor 154) is 28 hours, 56 minutes, which is a 5-minute increase from

the 28 hours, 51 minutes at the same non-participating receptor (receptor 154) indicated during the proceeding.

The revised model for this Site Permit Amendment indicates that for Option A, 295 receptors are predicted to experience no annual shadow flicker, 70 locations are predicted to experience less than 10 hours per year of shadow flicker, 38 locations are expected to have between 10 and 30 hours of shadow flicker per year, and 8 locations are expected to have more than 30 hours of shadow flicker per year. None of the receptors expected to have more than 30 hours of shadow flicker per year were non-participating receptors.

Summaries of the modeling results for Option A are presented in **Tables 8.4.3a** and **8.4.3b**. **Attachment E** provides the complete revised shadow flicker study and results for Option A.

Table 8.4.3a: Predicted Shadow Flicker Impacts at Participating Receptors

Statistic	Application Duration (hrs:mins/yr)	Option A Duration (hrs:mins/yr)	Option B Duration (hrs:mins/yr)
Maximum Shadow Flicker — Worst Case	124:30	125:12	125:12
Maximum Shadow Flicker — Expected Case	42:11	42:26	42:26

Table 8.4.3b: Predicted Shadow Flicker Impacts at Non-Participating Receptors

Statistic	Application Duration (hrs:mins/yr)	Option A Duration (hrs:mins/yr)	Option B Duration (hrs:mins/yr)
Maximum Shadow Flicker — Worst Case	83:00	83:15	83:15
Maximum Shadow Flicker — Expected Case	28:51	28:56	28:56

Option B

An analysis for Option B (**Maps 15b** and **16b** in **Attachment A**) indicates that the worst-case annual shadow flicker duration increases to 125 hours, 12 minutes and is at participating receptor 841. The maximum modeled worst-case annual flicker at a non-participating receptor (receptor 154) is 83 hours, 15 minutes, which is a 15-minute increase from the 83 hours, 0 minutes at non-participating receptor 154 indicated during the proceeding.

The maximum predicted expected annual shadow flicker duration for Option B is now 42 hours and 26 minutes (at participating receptor 841). This is an increase of 15 minutes compared to the analysis for the Application. The maximum predicted expected annual flicker at a non-participating receptor (receptor 154) is 28 hours, 56 minutes, which is a 5-minute increase from the 28 hours, 51 minutes at the same non-participating receptor (receptor 154) indicated during the proceeding.

The model for Option B indicates that 295 receptors are predicted to experience no annual shadow flicker, 70 locations are predicted to experience less than 10 hours per year of shadow flicker, 38 locations are expected to have between 10 and 30 hours of shadow flicker per year, and 8 locations are expected to have over 30 hours of shadow flicker per year. None of the receptors expected to have more than 30 hours of shadow flicker per year were non-participating receptors.

Summaries of the modeling results for Option B are presented in **Tables 8.4.3a** and **8.4.3b**, above. **Attachment F** provides the complete revised shadow flicker study and results for the Project's Option B.

Section 8.8 – Public Health and Safety

Section 8.8.1 – Electromagnetic Fields and Stray Voltage

Electromagnetic Fields

The proposed gen-tie line's associated electromagnetic field (EF) is calculated to be no greater than 5.0 kV/m at 1 meter above the ground within the project right-of-way (ROW). Existing transmission lines that parallel the Project are not included as part of this calculation. The fields generated by those lines will be determined during detailed engineering and through communications with transmission line owners. The proposed short 115 kV gen-tie line's EF will not exceed 8.0 kV/m within the ROW. There is no federal standard for gen-tie line or transmission line EFs. The Commission, however, has historically imposed a maximum EF limit of 8 kV/m measured at 1 meter above the ground.[2] The standard was designed to prevent serious hazards from shocks when touching large objects parked under alternating current transmission lines of 500 kV or greater.

Magnetic Fields

The gen-tie line's magnetic field (MF) will not exceed 500 milligauss (mG) within the ROW.

There is no Minnesota or federal standard on MFs. The Institute of Electrical and Electronic Engineers C95.6 standard provides the following guidance regarding low frequency (60 hertz) MF: The fields should not exceed 904 mG within or at the edge of the ROW. The peak MF value is calculated at a height of 1 meter above the ground.

[2] *In the Matter of the Route Permit Application for a 345 kV Transmission Line from Brookings County, Docket No. ET-2/TL-08-1471*, Order Granting Route Permit (adopting Finding 194 of ALJ) (September 14, 2010).

Section 8.10 – Land-Based Economies

Section 8.10.2 – Potential Impacts

The Application indicated that the primary impact to agricultural land from the Project was the reduction of crop production on a total of approximately 35.9 acres (14.5 hectares) of farmland.

Under both Option A and Option B, BRW anticipates a slight increase in permanent impacts to farmland due to the addition of the 115 kV gen-tie line. However, a decrease of 3.8 acres (1.5 hectares) of permanent impacts to farmland is anticipated due to the moving and reduction of the proposed footprint of the substation (see **Attachment H**). **Table 8.10.2** summarizes the anticipated change in permanent impacts to farmland from the relocation of the project substation and the addition of the gen-tie line for the revised Project from what was articulated in the Application.

Table 8.10.2: Summary of Changes in Farmland Impacts

Prime Farmland Type	Substation (acres/hectares)	Gen-Tie (acres/hectares)
All Areas Prime Farmland	(3.5) / (1.4)	<0.01 / <0.01
Prime Farmland if Drained	(0.3) / (0.1)	0
Farmland of Statewide Importance	0	0
Prime Farmland if Protected from Flooding or Not Frequently Flooded during Growing Season	0	0
Not Prime Farmland	0	0
Prime Farmland if Irrigated	0	0
TOTAL	(3.8) / (1.5)	<0.01 / <0.01

Note: Parentheses indicate a reduction in impacts.

Section 8.18 – Vegetation

Section 8.18.2 – Potential Impacts

Under both Option A and Option B, BRW anticipates that an additional 0.01% of land will be permanently converted for the addition of the gen-tie line. However, it is anticipated that the amount of land that will be permanently converted for the substation will decrease by 3.8 acres (1.5 hectares) due to relocating and reducing the proposed footprint of the substation (see **Attachment H)**. **Table 8.18.2** summarizes the anticipated change in permanent impacts to vegetation compared to the Application. BRW anticipates that changes to impacts from dropping Turbine 31 and activating Alt 3 will be nominal.

Table 8.18.2: Summary of Estimated Change in Permanent Impacts to Vegetation

Land Cover Type	Substation (acres/hectares)	Gen-Tie (acres/hectares)
Cultivated Crops	(3.7) / (1.5)	0.01 / <0.01
Hay/Pasture	0	0

Land Cover Type	Substation (acres/hectares)	Gen-Tie (acres/hectares)
Developed, Open Space	0.3 / 0.1	0
Developed, Medium Intensity	0	0
Herbaceous	(0.3) / (0.1)	<0.01 / <0.01
Native Plant Community	0	0
Total	(3.7) / (1.5)	0.01 / <0.01

Note: Parentheses indicate a reduction in impacts. The Application used 2011 National Land Cover Database (NLCD) data to inform vegetation impact calculations. Impact calculations above used 2016 NLCD data.

Section 8.18.3 – Mitigation Measures

For both Option A and Option B, BRW anticipates a reduction in impacts from the substation to lands currently under crop cultivation by approximately 71.2% from what was included in the Application because of relocating and reducing the footprint of the proposed substation (see **Attachment H)**. In addition, for both options, BRW anticipates that changes to impacts to land currently under crop cultivation from dropping Turbine 31 and activating Alt 3 will be nominal.

Section 8.19 – Wildlife Resources

Section 8.19.6 – Mitigation Measures

The gen-tie will be constructed in accordance with Avian and Power Line Interaction Committee guidelines.

Section 9.1 – Description of Resources

Section 9.1.9 – Spatial Wind Variation

Modeling for the Application indicated that the mean expected spatial variation in wind speed across the Project Area was between 8.7 and 9.6 m/s based on the turbine locations and their respective hub heights. Due to minor changes in turbine technology for this Site Permit Amendment, the mean expected spatial variation in wind speed across the Project Area is anticipated to be as follows for the two options:

- Option A: between 8.1 and 9.1 m/s
- Option B: between 8.1 and 8.9 m/s

Section 10.8 – Schedule

A revised schedule is presented in **Table 10.8**.

Table 10.8: Project Schedule

Activity	Estimated Completion	Date in Application
Certificate of Need Order	January 2021	December 2020
Site Permit Order	January 2021	December 2020
Land Acquisition	April 2022	June 2020
Site Permit Amendment Order	April 2022	n/a
Environmental Permits Received	May 2022	August 2020
Other Permits/Approvals Received	May 2022	August 2020
Construction	May – December 2022	June – November 2021
In-Service Date	December 2022	November 2021

Section 10.9 – Energy Projections

Option A

Under Option A, the annual net capacity factor is expected to be approximately 47% to 54%. The projected average annual output is approximately 450,000 to 460,000 MWh.

Option B

Under Option B, the annual net capacity factor is expected to be approximately 47% to 54%. The projected average annual output is approximately 450,000 to 460,000 MWh.

Section 10.10 – Decommissioning and Restoration

A revised decommissioning plan, which has been updated to include decommissioning of the proposed gen-tie line, is provided in **Attachment G**.

Site Permit Requested Changes

Due to the changes to the Project detailed above, BRW proposed the following changes to the text of the impacted Site Permit Sections (additions in underline and deletions in strikethrough). For the proposed new tables in the Site Permit, a new table is provided.

Section 1 – Site Permit

The Minnesota Public Utilities Commission (Commission) hereby issues this site permit to Buffalo Ridge Wind, LLC (Permittee) pursuant to Minnesota Statutes Chapter 216F and Minnesota Rules Chapter 7854. This permit authorizes the Permittee to construct and operate the Buffalo Ridge Wind Project, an up to ~~108.7~~ 106 megawatt (MW) nameplate capacity Large Wind Energy Conversion System (LWECS) and associated facilities in Lincoln and Pipestone County, Minnesota. The LWECS and associated facilities shall be built within the site identified in this permit and as identified in the attached site maps, hereby incorporated into this document.

Section 2 – Project Description

The project is comprised of a total of ~~45~~ 44 wind turbine~~s~~ sites (40 proposed wind turbines sites, plus ~~five~~ four alternate sites) for a capacity of up to ~~108.7~~ 106 MW. A maximum of 40 turbines are proposed for construction. As proposed, ~~the project will use 36 GE 2.82 MW wind turbine generators (WTGs) and four GE 2.52 MW WTGs.~~ the project will use 36 GE 2.82 MW wind turbine generators (WTGs) and either four GE 2.52 MW WTGs or four GE 2.32 MW WTGs. ~~Five~~ Four alternate sites are included to provide flexibility in the event constructability issues are encountered.

The turbines at hub height will be 292 feet (89 meters) for the GE 2.82 MW WTGs, 295 feet (90 meters) for the GE 2.52 MW WTGs, or 262 feet (80 meters) for the GE 2.32 MW WTGs. The rotor diameter for the turbines is 417 feet (127.2 meters) for the GE 2.82 MW WTGs or 382 feet (116.5 meters) for both the GE 2.52 and 2.32 MW WTGs. The project collector substation will connect to the existing Buffalo Ridge Substation via a 115 kV gen-tie line (less than 1,500 feet in length) that will cross existing transmission lines owned by Northern States Power Company. The Project will also include installation of one permanent meteorological (MET) tower. All of the turbines will utilize low-noise trailing edge (LNTE) serrations on the turbine blades to reduce sound impacts. LNTE serrations will be the same color as the turbine blades and cover approximately 20–30 percent of the trailing edge of the outboard blade length.

Section 2.1 – Associated Facilities

Associated facilities include the following: an approximately 1,370-foot-long 115 kV generation-tie line, underground collection and feeder lines (approximately 30 miles of 34.5 kV collector lines), temporary access roadways up to 45 feet in width for crane movement and equipment delivery, permanent all-weather gravel access roads 16 feet in width (approximately 20 miles,) one

MET tower, temporary staging/laydown construction area (15 acres), turbine construction area for each turbine (approximately five acres), an operation and maintenance (O&M) facility (two acres), and an aircraft detection lighting system.

Section 4.9 – Wind Turbine Towers

Replace the existing table with the following:

Design Features	GE 2.82 MW Turbine (Options A and B)	GE 2.52 MW Turbine (Option A)	GE 2.32 MW Turbine (Option B)
Generating Capacity	2.82 MW	2.52 MW	2.32 MW
Total Height (ground to fully extended blade tip)	152.1 meters (499 feet)	148.3 meters (487 feet)	138.3 meters (454 feet)
Hub Height	89 meters (292 feet)	90 meters (295 feet)	80 meters (262 feet)
Rotor Diameter	127.2 meters (417 feet)	116.5 meters (382 feet)	116.5 meters (382 feet)