

Will Seuffert

Executive Secretary

Minnesota Public Utilities Commission 121 7th Place East, Suite 350

Saint Paul, MN 55101

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MN Docket 17-410

13.0 PERMIT AMENDMENT

This permit may be amended at any time by the Commission in accordance with Minn. R. 7854.1300, subp. 2. Any person may request an amendment of the conditions of this permit by submitting a request to the Commission in writing describing the amendment sought and the reasons for the amendment. The Commission will mail notice of receipt of the request to the Permittee. The Commission may amend the conditions after affording the Permittee and interested persons such process as is required.

We are asking for the adoption of an amendment to help mitigate the negative consequences of shadow flicker on my property and other impacted landowners.

We have been active participants throughout the permitting process by participating in the contested hearing and submission of comments via the eDockets filing system. In the site permit, my residence is represented by Receptor #317. Shadow flicker data has been included with this request.

Based upon the developers projected “conservative estimate”, my husband and I are projected to receive around 123.6 hours of shadow flicker (7,416 minutes) which is over 4 times the limit established by Freeborn County Ordinance 26-56. The “Real Case” estimate reduces that total by 73% (1,995 minutes) based upon a modification of modeling parameters while still leaving our property over the 30 hour limit. This is unacceptable on our piece of paradise.

Support for Amendment

1. Modeling Based Upon Unprovided Data and Biased Fundamentals

The shadow flicker modeling used in the Freeborn Wind project is built upon data that has never been presented for validation and basic modeling fundamentals that are biased against landowners.

Data

The data used by Freeborn Wind is based upon two primary sources:

1. Data collected at a National Climatic Data Center in Minneapolis, MN (closest station to the project area)
2. Wind speed and direction data gathered by the company at sites in the project area

The data being used possesses many possible flaws that could negatively impact the landowners of the area. First, the distance between Minneapolis and the project area (around 100 miles) introduces a considerable margin of error into the data set. This issue is further compounded by the use of data from the project area, which has not been shared for validation and may not represent wind characteristics of this area that do not align with average meteorological conditions because of the relatively small snapshot it provides. In fact, Freeborn Wind admits in their initial permit application that their data could produce model results that underrepresent the shadow flicker impact (Freeborn Wind Farm: Site Permit Application - June 2017, p 39).

Modeling Assumptions

Compounding the data-related issues in the modeling are some of the assumptions built into modeling used by Freeborn Wind. First, the model creates a "shadow receptor" that measures the impact of shadow flicker on "a 1m x 1m window located 1m off the ground" (Freeborn Wind Site Permit Amendment Application - Attachment F, p 7). This "window" is presented as a conservative estimate because of the "greenhouse" modeling used, but in fact, represents a very minimalistic model that significantly favors the developer. This 1 square meter "window"

represents a tiny percentage of a landowner's property. On a five-acre property, the "window" of modeling represents 1/20234th of a landowner's entire property.

By accepting this modeling parameter, the developer is failing to present the real impact of shadow flicker on a landowner's entire property. In accepting this as a valid modeling practice, the Commission is sanctioning that a landowner's protection under shadow flicker ordinances (and noise standards/special conditions) only apply to a minuscule portion of a landowner's property identified by the developer and not to the entire property of the landowner. Thus, landowners are having their property rights stripped from them.

2. Compliance with Freeborn County Ordinance

While the state of Minnesota has not yet established rules/criteria for the acceptable levels of shadow flicker, Freeborn County created an ordinance, and Freeborn Wind has acknowledged that their project will adhere to said regulation. The Freeborn County Ordinance Chapter 26, Section 56, states that a shadow flicker "at any receptor shall not exceed 30 hours per year" (Freeborn County Ordinance, Chapter 26, Section 56). The ordinance allows for the modeling to determine this to consider topography but limits other possible reduction factors. At no point in the Freeborn County ordinance, does the county give the developer the right to reduce shadow flicker estimates to a "Realistic Case" through the use of estimated reductions based upon operational time, wind direction, etc.

The developer's decision to utilize a "Realistic Case" model is another example helping to confirm the trend of the developer moving the proverbial "goalposts" to ensure that their project could be compliant with existing standards and ordinances. As in the case of significantly changing the ground factor of their noise modeling, the developer has elected to make assumptions that will dramatically reduce the projected impact of shadow flicker. By doing so, the developer even admits that this could result in an underestimation of the effects.

3. Burdensome Mitigation Plan

When unable to redefine modeling parameters to show compliance, the developer has used the promise of mitigation to achieve compliance. According to the developer's shadow-flicker plan, the following mitigation methods would be utilized:

- Communication with adjacent landowners on when shadow flicker is possible and how to minimize the shadow flicker effects
- Installation of indoor screening, such as curtain or blinds in windows, where appropriate and reasonable
- Provide exterior screening, such as a vegetation buffer or awnings over windows, where appropriate and reasonable; and
- Turbine Control Software programmed to shut down specific turbine or turbines for an appropriate amount of time to reduce flicker to below 30 hours per year at each home (Freeborn Wind Site Permit - June 2017, p 40).

The first three steps of the mitigation plan do not comply with the Freeborn County ordinance. The ordinance does not allow for a residence to be subject to over 30 hours of shadow flicker as long as the developer talks to the homeowner, pays for the installation of some curtains (if the developer finds it reasonable), or plants some saplings (again, if the developer finds it reasonable). In fact, the ordinance clearly states that shadow flicker modeling cannot take into account obstacles such as "accessory structures and trees." (Freeborn County Ordinance 26-56). Immediately, it can be seen that the mitigation steps provided by the developer run into direct conflict with the county ordinance and should be considered insufficient and invalid.

The last remaining mitigation step is the use of "Turbine Control Software" to limit shadow flicker. This utilization of this mitigation step rests entirely with the managing entity of the project. The developer has made it clear that the mitigation of any shadow flicker issues will only occur once a resident complains to the managing entity. (Freeborn Wind Site Permit - June 2017, p 40). This methodology of mitigation runs into stark contrast with the idea that mitigation is supposed to represent practices by the applicant to limit damages to the aggrieved. Instead, this method ensures that the impacted landowners will suffer greater than 30 hours of shadow flicker

before the managing entity even acts. The mitigation plan's danger is even more apparent when the managing body has not fulfilled step one of the mitigation plan by communicating with the impacted landowners. As currently written, the mitigation plan would require that the managing entity violate the current Freeborn County ordinance (while subjecting landowners to illegal amounts of shadow flicker) and continue to be in violation for weeks or months while the impacted landowners lodge a complaint and the managing entity reviews its "reasonable" response to the complaint.

Based upon the above factors, it is clear that the permit requires amended conditions, including the following:

1. Developer must re-site a limited number of turbines into a configuration that will prevent adjacent landowners from receiving more than 30 hours of shadow flicker on their property.
2. Refinement of the mitigation process to ensure that mitigation steps are compliant with the Freeborn County Ordinance Chapter 26, Section 56 and do not require violation of the ordinance before the initiation of mitigation practices thus ensuring that landowners in the project are never subjected to shadow flicker exceeding the 30 hour standards established by Freeborn County Ordinance 26-56.
3. Following the ALJ recommendation, the developer agrees to a limit of 27 hours of modeled shadow flicker to ensure that no residents are subjected to more than 30 hours of shadow flicker, especially during the initial operation of the project.

Sincerely,

Kathy and Greg Nelson

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Glenville, MN 56036

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Project:

Freeborn

Description:

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Calculated:

8/19/2019 3:07 PM/3.1.633

SHADOW - Calendar

Calculation: L079 Clipped w/263 Houses **Shadow receptor:** 317 - Non-Participant

Assumptions for shadow calculations

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.53	0.59	0.57	0.56	0.62	0.67	0.74	0.69	0.62	0.51	0.37	0.38

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	364	349	399	598	1,082	1,220	632	491	661	1,202	943	8,548

Idle start wind speed: Cut in wind speed from power curve

January		February		March		April		May		June	
1	07:46	08:44 (T-42)	07:30	15:49 (T-41)	06:51	07:17 (T-43)	06:56	07:17 (T-44)	06:07	05:35	
	16:47	53	16:19 (T-41)	17:24	70	16:59 (T-40)	18:00	20	07:37 (T-44)	20:13	20:46
2	07:46	08:45 (T-42)	07:29	15:49 (T-41)	06:49	07:17 (T-43)	06:54		07:17 (T-44)	06:05	05:35
	16:48	52	16:20 (T-41)	17:25	70	16:59 (T-40)	18:01	18	07:35 (T-44)	20:14	20:47
3	07:46	08:46 (T-42)	07:28	15:49 (T-41)	06:47	07:19 (T-43)	06:53		07:19 (T-44)	06:04	05:34
	16:49	52	16:21 (T-41)	17:26	72	17:01 (T-40)	18:02	14	07:33 (T-44)	20:16	20:48
4	07:46	08:48 (T-42)	07:27	15:50 (T-41)	06:46	07:20 (T-43)	06:51		07:20 (T-44)	06:03	05:34
	16:50	50	16:22 (T-41)	17:28	73	17:03 (T-40)	18:04	10	07:30 (T-44)	20:17	20:48
5	07:46	08:50 (T-42)	07:26	15:51 (T-41)	06:44	07:22 (T-43)	06:49		06:01	05:33	
	16:51	49	16:23 (T-41)	17:29	73	17:04 (T-40)	18:05		20:18	20:49	
6	07:46	08:53 (T-42)	07:24	15:52 (T-41)	06:42	07:24 (T-43)	06:47		06:00	05:33	
	16:52	45	16:24 (T-41)	17:30	73	17:06 (T-40)	18:06	10	07:34 (T-43)	19:44	20:50
7	07:46	15:44 (T-41)	07:23	15:53 (T-41)	06:41		06:45		05:59	05:33	
	16:53	41	16:25 (T-41)	17:32	72	17:07 (T-40)	18:07		20:20	20:51	
8	07:46	15:44 (T-41)	07:22	15:54 (T-41)	07:39		06:44		05:57	05:32	
	16:54	42	16:26 (T-41)	17:33	69	17:07 (T-40)	18:09		20:21	20:51	
9	07:46	15:44 (T-41)	07:21	15:56 (T-41)	07:37		06:42		05:56	05:32	
	16:55	44	16:28 (T-41)	17:35	65	17:07 (T-40)	19:10		20:23	20:52	
10	07:45	15:45 (T-41)	07:19	15:57 (T-41)	07:35		06:40		05:55	05:32	
	16:56	44	16:29 (T-41)	17:36	60	17:05 (T-40)	19:11		20:24	20:53	
11	07:45	15:44 (T-41)	07:18	15:59 (T-41)	07:34		06:39		05:54	05:32	
	16:57	46	16:30 (T-41)	17:37	55	17:05 (T-40)	19:12		20:25	20:53	
12	07:45	15:44 (T-41)	07:17	16:00 (T-41)	07:32		06:37		05:52	05:32	
	16:58	47	16:31 (T-41)	17:39	50	17:03 (T-40)	19:14		20:26	20:54	
13	07:44	15:44 (T-41)	07:15	16:03 (T-41)	07:30		06:35		05:51	05:31	
	16:59	47	16:31 (T-41)	17:40	40	17:01 (T-40)	19:15		20:27	20:54	
14	07:44	15:44 (T-41)	07:14	07:35 (T-43)	07:28		06:33		05:50	05:31	
	17:00	49	16:33 (T-41)	17:41	33	16:59 (T-40)	19:16		20:28	20:55	
15	07:44	15:44 (T-41)	07:12	07:33 (T-43)	07:27		06:32		05:49	05:31	
	17:02	49	16:33 (T-41)	17:43	17	16:20 (T-41)	19:17		20:29	20:55	
16	07:43	15:45 (T-41)	07:11	07:32 (T-43)	07:25		06:30		05:48	05:31	
	17:03	49	16:34 (T-41)	17:44	10	07:42 (T-43)	19:19		20:30	20:56	
17	07:43	15:44 (T-41)	07:10	07:30 (T-43)	07:23		06:28		05:47	05:31	
	17:04	50	16:34 (T-41)	17:45	13	07:43 (T-43)	19:20		20:31	20:56	
18	07:42	15:44 (T-41)	07:08	07:29 (T-43)	07:21		06:27		05:46	05:31	
	17:05	51	16:35 (T-41)	17:47	16	07:45 (T-43)	19:21		20:32	20:56	
19	07:41	15:45 (T-41)	07:07	07:27 (T-43)	07:19		06:25		05:45	05:32	
	17:07	51	16:36 (T-41)	17:48	18	07:45 (T-43)	19:22		20:34	20:57	
20	07:41	15:45 (T-41)	07:05	07:26 (T-43)	07:18		06:24		05:44	05:32	
	17:08	51	16:36 (T-41)	17:49	21	07:47 (T-43)	19:23		20:35	20:57	
21	07:40	15:45 (T-41)	07:04	07:24 (T-43)	07:16		06:22		05:43	05:32	
	17:09	51	16:36 (T-41)	17:51	23	07:47 (T-43)	19:25		20:36	20:57	
22	07:39	15:45 (T-41)	07:02	07:22 (T-43)	07:14	07:34 (T-44)	06:20		05:42	05:32	
	17:10	54	16:44 (T-40)	17:52	25	07:47 (T-43)	19:26	3	07:37 (T-44)	20:03	20:58
23	07:38	15:45 (T-41)	07:00	07:21 (T-43)	07:12	07:32 (T-44)	06:19		05:41	05:32	
	17:12	57	16:45 (T-40)	17:53	26	07:47 (T-43)	19:27	6	07:38 (T-44)	20:04	20:58
24	07:38	15:46 (T-41)	06:59	07:19 (T-43)	07:10	07:30 (T-44)	06:17		05:41	05:33	
	17:13	59	16:47 (T-40)	17:55	28	07:47 (T-43)	19:28	9	07:39 (T-44)	20:05	20:58
25	07:37	15:46 (T-41)	06:57	07:18 (T-43)	07:09	07:28 (T-44)	06:16		05:40	05:33	
	17:14	61	16:48 (T-40)	17:56	29	07:47 (T-43)	19:29	11	07:39 (T-44)	20:06	20:58
26	07:36	15:46 (T-41)	06:56	07:16 (T-43)	07:07	07:27 (T-44)	06:14		05:39	05:33	
	17:16	63	16:50 (T-40)	17:57	31	07:47 (T-43)	19:31	13	07:40 (T-44)	20:07	20:58
27	07:35	15:46 (T-41)	06:54	07:16 (T-43)	07:05	07:25 (T-44)	06:13		05:38	05:34	
	17:17	65	16:51 (T-40)	17:58	30	07:46 (T-43)	19:32	15	07:40 (T-44)	20:09	20:58
28	07:34	15:47 (T-41)	06:52	07:17 (T-43)	07:03	07:23 (T-44)	06:11		05:38	05:34	
	17:18	66	16:53 (T-40)	18:00	29	07:46 (T-43)	19:33	17	07:40 (T-44)	20:10	20:58
29	07:33	15:47 (T-41)			07:01	07:21 (T-44)	06:10		05:37	05:34	
	17:20	67	16:54 (T-40)		19:34	07:39 (T-44)	20:11	18	07:39 (T-44)	20:11	20:58
30	07:32	15:48 (T-41)			07:00	07:19 (T-44)	06:08		05:36	05:35	
	17:21	68	16:56 (T-40)		19:35	07:38 (T-44)	20:12	19	07:38 (T-44)	20:12	20:58
31	07:31	15:48 (T-41)			06:58	07:18 (T-44)			05:36		
	17:22	69	16:57 (T-40)		19:37	07:38 (T-44)		20	07:38 (T-44)	20:45	
Potential sun hours	290		294		369		402		455		461
Total, worst case	1642		1191		254		62				
Sun reduction	0.53		0.59		0.57		0.56				
Oper. time red.	0.98		0.98		0.98		0.98				
Wind dir. red.	0.56		0.59		0.67		0.64				
Total reduction	0.29		0.34		0.37		0.35				
Total, real	472		404		94		22				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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Project:

Freeborn

Description:

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Calculated:

8/19/2019 3:07 PM/3.1.633

SHADOW - Calendar

Calculation: L079 Clipped w/263 Houses **Shadow receptor:** 317 - Non-Participant

Assumptions for shadow calculations

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.53	0.59	0.57	0.56	0.62	0.67	0.74	0.69	0.62	0.51	0.37	0.38

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	364	349	399	598	1,082	1,220	632	491	661	1,202	943	8,548

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:35 20:58	06:02 20:38	06:36 19:51	07:10 18:55	06:48 17:05	15:26 (T-41) 16:35 (T-40)
2	05:36 20:58	06:03 20:36	06:37 19:50	07:11 18:54	61 17:04	16:38 16:36 (T-40)
3	05:36 20:58	06:04 20:35	06:38 19:48	07:12 18:52	67 17:02	44 16:37 (T-40)
4	05:37 20:58	06:05 20:34	06:39 19:46	07:13 18:50	70 17:01	44 16:37 (T-40)
5	05:38 20:57	06:06 20:33	06:40 19:44	07:14 18:48	72 17:00	42 16:37 (T-40)
6	05:38 20:57	06:07 20:31	06:42 19:43	07:16 18:46	73 16:59	41 16:36 (T-40)
7	05:39 20:57	06:08 20:30	06:43 19:41	07:17 18:45	73 16:58	41 16:36 (T-40)
8	05:40 20:56	06:09 20:29	06:44 19:39	07:18 18:43	72 16:57	48 16:35 (T-40)
9	05:40 20:56	06:10 20:27	06:45 19:37	07:19 18:41	71 16:56	52 16:34 (T-40)
10	05:41 20:56	06:11 20:26	06:46 19:35	07:20 18:39	70 16:55	52 16:33 (T-40)
11	05:42 20:55	06:13 20:25	06:47 19:34	07:21 18:38	70 16:54	53 16:32 (T-40)
12	05:43 20:55	06:14 20:23	06:48 19:32	07:22 18:36	69 16:53	53 16:31 (T-40)
13	05:43 20:54	06:15 20:22	06:49 19:30	07:23 18:34	69 16:52	54 16:30 (T-40)
14	05:44 20:54	06:16 20:20	06:50 19:28	07:24 18:33	67 16:51	55 16:29 (T-40)
15	05:45 20:53	06:17 20:19	06:51 19:26	07:25 18:31	66 16:50	55 16:28 (T-40)
16	05:46 20:52	06:18 20:17	06:52 19:25	07:26 18:29	65 16:49	54 16:27 (T-40)
17	05:47 20:52	06:19 20:16	06:53 19:23	07:27 18:28	63 16:48	55 16:26 (T-40)
18	05:48 20:51	06:20 20:14	06:54 19:21	07:28 18:26	63 16:47	54 16:25 (T-40)
19	05:49 20:50	06:21 20:13	06:55 19:19	07:29 18:24	61 16:46	54 16:24 (T-40)
20	05:50 20:49	06:23 20:11	06:57 19:17	07:30 18:23	59 16:45	55 16:23 (T-40)
21	05:51 20:49	06:24 20:10	06:58 19:15	07:31 18:21	57 16:44	55 16:22 (T-40)
22	05:51 20:48	06:25 20:08	06:59 19:14	07:32 18:20	57 16:43	55 16:21 (T-40)
23	05:52 20:47	06:26 20:06	07:01 19:12	07:33 18:18	51 16:42	55 16:20 (T-40)
24	05:53 20:46	06:27 20:05	07:02 19:10	07:34 18:17	51 16:41	55 16:19 (T-40)
25	05:54 20:45	06:28 20:03	07:03 19:08	07:35 18:15	51 16:40	55 16:18 (T-40)
26	05:55 20:44	06:29 20:02	07:04 19:06	07:36 18:14	50 16:39	55 16:17 (T-40)
27	05:56 20:43	06:30 20:00	07:05 19:04	07:37 18:12	49 16:38	55 16:16 (T-40)
28	05:57 20:42	06:32 19:58	07:06 19:03	07:38 18:11	49 16:37	55 16:15 (T-40)
29	05:59 20:41	06:33 19:56	07:07 19:01	07:39 18:09	48 16:36	55 16:14 (T-40)
30	06:00 20:40	06:34 19:55	07:09 18:57	07:40 18:08	48 16:35	55 16:13 (T-40)
31	06:01 20:39	06:35 19:53		07:41 18:06	47 16:34	54 16:12 (T-41)
Potential sun hours	467	433	377	342	292	279
Total, worst case			198	631	1826	1612
Sun reduction			0.62	0.51	0.37	0.38
Oper. time red.			0.98	0.98	0.98	0.98
Wind dir. red.			0.64	0.65	0.55	0.60
Total reduction			0.39	0.32	0.20	0.22
Total, real			77	203	363	360

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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