



Oldman 2 Wind Farm Limited

Oldman 2 Wind Farm Post-Construction Sound Survey at Six Locations

December 7, 2016

Alberta Utilities Commission

Decision 21191-D01-2016

Oldman 2 Wind Farm Limited

Post-Construction Sound Survey at Six Locations

Proceeding 21191

Applications 21191-A001

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1 Decision summary

1. In this decision, the Alberta Utilities Commission must decide whether to approve a post-construction sound survey for the Oldman 2 Wind Farm filed pursuant to Condition 6 of Approval U2013-260 by Mainstream Renewable Power Ltd. (Mainstream) on behalf of Oldman 2 Wind Farm Limited (Oldman 2). A request for a waiver for the dwelling referred to as Receptor C, where the noise levels were found to be above the daytime and nighttime permissible sound levels (PSLs) was filed. However, this request for a waiver was withdrawn on August 22, 2016. The Commission refers to Oldman 2 in its determinations on the comprehensive sound level survey because Oldman 2 is the approval holder.

2. For the reasons set out later in this decision, the Commission makes the following findings:

- that the comprehensive sound level survey conducted at the dwellings referred to as receptors B and C fails to demonstrate compliance with the PSLs of 40 dBA L_{eq} nighttime and 50 dBA L_{eq} daytime and other requirements of Rule 012: *Noise Control*;
- that the sound level surveys conducted at the dwellings referred to as receptors E and L were conducted in accordance with the requirements of Rule 012, and meet the nighttime PSLs;
- that compliance with daytime PSLs was demonstrated at receptors E and L, although isolation analysis was not conducted; and
- that the dwellings referred to as receptors B, C, J and K did not have meteorological stations placed within a distance of 100 metres from the microphone locations, as required by Rule 012.

As a result, the Commission orders Oldman 2 to conduct comprehensive sound level surveys at receptors B, J and K and submit reports of the surveys to the Commission by April 30, 2017. A comprehensive sound level survey at the Receptor C dwelling is not required because the dwelling is no longer occupied.

2 Introduction and background

3. On December 21, 2015, Mainstream, the operator of the Oldman 2 Wind Farm, filed a post-construction sound survey for the wind farm pursuant to Condition 6 in Approval 2010-324

(Errata) on behalf of Oldman 2. This condition was repeated in subsequent approvals, the last one being Approval U2013-260.¹ Condition 6 stipulates:

6. Within one year of connecting to the Alberta Interconnected Electric System and becoming operational, Oldman 2 shall, in accordance with the requirements stipulated in AUC Rule 012, conduct a comprehensive sound level survey at the dwellings in the application as Receptors A (if occupied), B, C (if occupied), E, J, K, and L, and submit a report of the survey to the Commission.

4. The post-construction sound level survey report entitled *Oldman 2 Wind Farm Post-Construction Sound Survey at Six Locations September 2015* (the report)² was registered in Proceeding 21191. It stated that the dwelling referred to as Receptor A was not occupied and a sound level survey at that location was not required under Condition 6. However, the dwelling referred to as Receptor C was occupied and a sound level survey was conducted at this location. Upon completion, Oldman 2 requested an exemption from the PSLs of 40 dBA L_{eq} nighttime and 50 dBA L_{eq} daytime at this dwelling.³

5. The report indicated that SLR Consulting (Canada) Ltd. (SLR) conducted sound level surveys over four nighttime periods commencing on Wednesday, September 16, 2015 and ending on Sunday, September 20, 2015 at six dwellings referred to as receptors B, C, E, J, K and L. When discussing this report, the Commission refers to SLR rather than Oldman 2 which commissioned the report.

6. The following tables present a summary of the results of the sound level surveys:

Table 1. Comparison of isolated sound levels to AUC nighttime permissible sound levels⁴

Location ID (Receptor/Residence name)	September 16-17, 2015	September 17-18, 2015	September 18-19, 2015	September 19-20, 2015	Nighttime Permissible Sound Level (dBA L_{eq})
Isolated Nighttime Sound Level (dBA L_{eq}) and valid hours of data					
B (Trodden)	37.2 (0.5 hrs)	36.8 (1.4 hrs)	All Invalid	37.3 (0.7 hrs)	40
C (Hann)	51.9 (1.6 hrs)	52.1 (6.9 hrs)	51.9 (1.4 hrs)	51.1 (3.2 hrs)	40
E (Everett)	38.4 (1.0 hrs)	37.6 (4.2 hrs)	37.9 (2.7 hrs)	37.8 (1.0 hrs)	40
J (Dingreville)	38.2(4.9 hrs)	37.5 (4.3 hrs)	38.1 (2.0 hrs)	36.1 (2.5 hrs)	40
K (Vaughan)	38.0 (3.8 hrs)	37.9 (2.4 hrs)	38.9 (1.8 hrs)	38.0 (0.9 hrs)	40
L (Barr)	35.6 (5.2hrs)	37.4 (4.4 hrs)	36.5 (0.2 hrs)	35.7 (1.3 hrs)	40

¹ Power Plant Approval U2013-260, Proceeding 2572, Application 1609509, May 15, 2013.

² Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations.

³ Exhibit 21191-X0002, Oldman 2 letter request for waiver for Receptor C.

⁴ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, Table C, PDF page 18.

Table 2. Measured daytime and nighttime sound levels without isolation analysis⁵

Location ID (Residence name)	Measured Daytime and Nighttime Sound Level (dBA L _{eq})								Daytime and Nighttime Permissible Sound Level (dBA L _{eq})
	September 16 2015	September 16-17, 2015	September 17 2015	September 17-18, 2015	September 18 2015	September 18-19, 2015	September 19 2015	September 19-20, 2015	
	Day	Night	Day	Night	Day	Night	Day	Night	
B (Trodden)	45.4	41.8	50.8	45.7	55.3	54.5	54.7	60.9	50/40
C (Hann)	50.4	48.4	52.1	51.7	53.6	52.3	55.5	51.8	50/40
E (Everett)	44.0	38.3	46.5	39.3	47.5	41.7	48.2	44.7	50/40
J (Dingreville)	38.5	38.1	42.9	38.4	46.3	41.4	47.0	42.0	50/40
K (Vaughan)	40.3	37.7	46.6	40.3	51.5	43.8	50.1	46.5	50/40
L (Barr)	43.3	42.3	49.7	45.7	54.5	44.2	55.0	40.6	50/40

7. A notice of application was issued on March 3, 2016, and statements of intent to participate were received from Bob and Bev Barr, David Huebner, the Alberta Wilderness Association, Benign Energy Canada II Inc. and Heritage Wind Farm Development Inc. (Heritage Wind), Alberta Wind Energy Corporation (AWEC), and Stewart and Theresa Hann. In rulings dated May 25, 2016 and August 2, 2016, the Commission granted standing to Bob and Bev Barr, David Huebner, Heritage Wind, AWEC, and Stewart and Theresa Hann.

8. The Commission issued a notice of hearing on June 27, 2016. An information session was held by Commission staff on August 3, 2016 in Pincher Creek.

9. On August 22, 2016, Oldman 2 withdrew its request for an exemption for Receptor C.⁶

10. On August 23, 2016, Ms. Hann filed evidence,⁷ and confirmed that she would be in attendance at the hearing.

11. On August 24, 2016, Regulatory Law Chambers filed a letter stating that it had been retained to represent Heritage Wind in the proceeding,⁸ and filed a report prepared by dBA Noise Consultants Ltd. (dBA Consultants)⁹ critiquing the SLR report.

⁵ Compiled from Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations.

⁶ Exhibit 21191-X0035, Withdrawal of Receptor "C" Waiver Request.

⁷ Exhibit 21191-X0039, Statement of landowners.

12. On August 26, 2016, Heritage Wind stated that it would not be attending the hearing because the exemption request for Receptor C was withdrawn by Mainstream.¹⁰⁻¹¹ AWEC also confirmed that it would not be attending the hearing for the same reason.¹²

13. The hearing commenced on September 7, 2016 in Pincher Creek, Alberta before a Commission panel comprising Panel Chair Anne Michaud and Acting Commission members Kate Coolidge and Bohdan Romaniuk.

14. Following oral argument and reply, undertakings were filed on September 9, 2016. The Commission considers September 9, 2016 as the close of record for Proceeding 21191.

3 Issues

3.1 Introduction

15. At the outset, the Commission notes that Mr. Matt Gaskell, CET who conducted the sound level survey at the above-noted dwellings and Mr. Richard Wright, P. Eng. who authored the report, were not in attendance at the hearing. Mr. Pascal Everton, P. Eng. of SLR attended to speak to the report. Mr. Henk de Haan, Eur. Ing. acoustical practitioner, of dBA Consultants did not attend the hearing because Heritage Wind did not participate in the oral hearing. However, Heritage Wind did not withdraw the report prepared by dBA Consultants. The Commission nonetheless considered this report in making its determinations because, as acknowledged by Mr. Everton, Mr. de Haan is a reputable acoustical practitioner in Alberta.

16. The issues raised in this proceeding are as follows:

- microphone locations and sound level meters
- portable meteorological stations
- representative conditions and isolation analysis
- three hours of cumulative data
- waiver for Receptor C and cumulative effects of energy-related facilities

3.2 Microphone locations and sound level meters

3.2.1 Views of the applicant

17. According to SLR's report, it placed the microphones on tripods at a height of 1.5 metres at each of the dwellings. Such placement of the microphones was based on its professional judgement, considering topography, the location of other outbuildings, vegetation that would affect the measurements, and resident comments. Most microphones were not placed at the standard 15 metres from the dwelling, but were considered by SLR to be placed in the most appropriate location, with the most direct line of sight to the nearest wind turbine(s).¹³

⁸ Exhibit 21191-X0040, Cover Letter Technical Review of OM2 Post-construction CSL Survey.

⁹ Exhibit 21191-X0041, Technical Review of OM2 Post-construction CSL Survey.

¹⁰ Exhibit 21191-X0043, Heritage Wind Farm Development Inc. Letter re hearing attendance 2016-08-25.

¹¹ Exhibit 21191-X0046, Letter from Heritage Wind Farm Development Inc. re Hearing attendance 2016-08-28.

¹² Exhibit 21191-X0037, Alberta Wind Energy Corporation email to AUC.

¹³ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 8.

Mr. Everton testified that Rule 012 recognizes that other measurement locations may be used if it is physically impractical or acoustically illogical to measure where specified.¹⁴

18. Mr. Everton referred to photographs¹⁵ taken after the microphones were in place to describe the microphone locations during the sound level survey and provided explanations for the placement of microphones farther than the standard 15 metres from certain dwellings. The microphone at Receptor B was placed 23 metres south of the dwelling because there were obstructions at the distance of 15 metres south of the dwelling. The microphone location selected allowed a more open view to the west toward the nearest wind turbines and away from interfering vegetation.

19. The microphone at Receptor C was placed 20 metres northeast of the garage, where there was a direct view of the nearest wind turbines.¹⁶

20. The microphone at Receptor J was placed 10 metres north of the residence because if it had been placed closer, in the direction of the wind turbine, it would have been shielded in the acoustic shadow of the escarpment, resulting in lower measured sound levels. If the microphone had been placed closer to the dwelling, the measured sound levels would have been higher because of the sound reflections from the dwelling.¹⁷

21. The dwelling at Receptor K is surrounded on three sides by hills to the north, west and east. A fence extending along the west side of the property and large trees with significant foliage could have potentially shielded the microphone from some wind turbine noise. In order to avoid these other noise sources and potential barrier effects of the fence, the microphone was placed farther north in a clear opening, 25 metres north of the dwelling.¹⁸

22. The dwelling at Receptor L is located in the river valley. The microphone was placed 28 metres east of the dwelling because had the microphone been placed 15 metres from the dwelling, it would have been positioned on the driveway, limiting vehicle access to the dwelling. From this microphone location, the hub of the nearest wind turbine is barely visible and the remainder of the mast is hidden by the hills.¹⁹ Mr. Everton testified that he was not aware of the Barr's request to have the microphone placed at the dwelling and explained that Rule 012 requires the microphone location at a distance of 15 metres from the dwelling.²⁰

23. During questioning about microphone locations, Ms. Ines Ribeiro Canella testified that Oldman 2 was aware of the Vaughans' concerns in early 2015, as well as those of the Barrs which included noise and the impact of navigation lights from the nearest wind turbine T9.²¹ Ms. Ribeiro Canella also indicated that in order to address landowner concerns, SLR had

¹⁴ Transcript, PDF page 33, lines 10 to 12.

¹⁵ The photographs had not been filed on the record of the proceeding. Oldman 2 undertook to submit these photographs, and filed them on September 9, 2016 as Exhibit 21191-X0053, Site Photographs from Environmental Sound Assessment - Sept 2015.

¹⁶ Transcript, PDF page 67, lines 8 to 22.

¹⁷ Transcript, PDF page 70, lines 9 to 19.

¹⁸ Transcript, PDF page 70, lines 20 to 25 and page 71, lines 1 to 6.

¹⁹ Transcript, PDF page 71, lines 8 to 25 and page 73, line 1 to 16.

²⁰ Transcript, PDF page 76, lines 19 to 25 and page 77, lines 1 to 4.

²¹ Transcript, PDF page 26, lines 20 to 23 and PDF page 28, lines 1 to 16.

conducted a sound level survey at the Vaughan and Barr dwellings in March 2015²² to determine noise levels at each of these dwellings. She added that the noise levels were determined to be under the 40 decibel level when appropriate adjustments were made.²³ In response to questions, Mr. Everton stated that the March 2015 sound level surveys captured two nighttime periods. The March 2015 study was conducted in a similar manner as the study outlined in the report,²⁴ with the exception that for the March 2015 study, the microphones were fitted with a single standard primary wind screen and not with secondary wind screens.²⁵ Mr. Everton testified that the March 2015 sound level survey did not collect three hours of valid cumulative data due, in part, to the use of only a single primary wind screen that limited the number of valid hours of data.²⁶

24. Mr. Everton stated that because neither the Barrs nor the Vaughans had filed a noise complaint with the Commission, there was no reason to seek out what the residents deemed to be representative conditions for the comprehensive sound level survey.²⁷ Mr. Everton said that he could not speak directly to the Vaughans' comments on the noise at their dwelling from the wind turbines.²⁸ He added that although Mr. Gaskell, who set up the equipment, would have listened to the recordings, interpreting sounds by listening to recordings was very different than listening to sounds first hand while standing at the location.²⁹

25. The survey report also indicated that Larson Davis Model 824 Type 1 sound level meters fitted with Brüel & Kjær UA0237 primary wind screens and Brüel & Kjær EH-2152 secondary wind screens were set up at each of the six receptor locations, and that audio recordings at each receptor location were conducted using Marantz Professional PMD 620 MP3 recorders.³⁰ These individual components were all Type 1 components. Corrections were applied to the measured data to compensate for the additional attenuation caused by the secondary wind screens using the manufacturer's insertion loss data.³¹

26. The sound level meters were programmed to record continuous 1-minute A-weighted L_{eq} sound levels, as well as L_{min} and L_{max} for the 1-minute measurements. The 1-minute L_{eq} values were then used to calculate hourly, daytime, and nighttime dBA L_{eq} values. All sound level meters had been factory calibrated within the previous 12 months of the study. The sound level meters were again calibrated before the start and at the end of the field measurement periods³² using a Larson Davis CAL200 calibrator that was calibrated within one year of the study in accordance with Rule 012.

3.2.2 Views of the interveners

27. Ms. Hann asked Mr. Everton why the microphone at Receptor C was placed where the sound would reflect off the house, the garage, the barn and all the sheds rather than just outside

²² Transcript, PDF page 27, lines 1 to 3.

²³ Transcript, PDF page 75, lines 11 to 13.

²⁴ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations.

²⁵ Transcript, PDF page 48, lines 7 to 12.

²⁶ Transcript, PDF page 48, lines 16 to 21.

²⁷ Transcript, PDF page 74, lines 9 to 13.

²⁸ Transcript, PDF page 99, lines 7 to 9.

²⁹ Transcript, PDF page 99, lines 10 to 19.

³⁰ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 10.

³¹ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 13.

³² Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 142.

the yard. Mr. Everton explained that the microphone was located 20 metres northeast of the garage and that he could only assume that the noise technician would have put the microphone further north to avoid blocking the driveway while maintaining the microphone between the nearest wind turbine and the dwelling. Mr. Everton explained that the microphone location would have been the most logical position, irrespective of other structures found nearby.³³

28. In her written statement of intent to participate, Mrs. Barr, one of the residents at Receptor L, expressed several noise concerns and asked SLR to place the microphone at the dwelling where the Barrs could hear “a lot of noise”.³⁴ A sound level survey was conducted at the Barr and Vaughan dwellings in March 2015 to investigate their noise concerns.³⁵

29. The Vaughans, who reside at Receptor K, filled out a noise complaint investigation form Part 2, which was included in the report.³⁶ They described the wind turbine noise at their residence as being “obnoxious”, “pulsating”, “waking them up”, and “very aggravating”.³⁷

3.2.3 dBA Consultants’ critique on sound level meters

30. In its Technical Review, dBA Consultants questioned whether the factory calibration certificates applied to the sound level meter itself and not to the pre-amplifier, putting into question whether the instrumentation used by SLR meets the Type 1 requirements.³⁸

31. dBA Consultants also pointed out that the measurements were conducted using a primary windscreen in combination with a secondary windscreen. dBA Consultants stated that the adjustments for insertion loss attributable to the individual wind screen, as provided by the manufacturer, do not necessarily apply to the two windscreens when they are used in combination. dBA Consultants suggested that this puts into question whether corrections for the primary windscreen, in combination with the secondary windscreen, were applied correctly.

3.2.4 Commission findings

32. Although Rule 012 sets out that microphones are to be placed at a distance of 15 metres from a dwelling in the direction of the noise source, Rule 012 allows for the placement of microphones at other locations in situations where it is physically impractical or acoustically illogical to measure at the 15-metre distance. Based on the site photographs of the microphone locations and the explanations given at the hearing for the placement of the microphones at a distance other than 15 metres, the Commission accepts that based on the acoustical practitioner’s professional judgement, the microphones were placed in suitable locations for conducting the comprehensive sound level survey at each of the six dwellings.

33. The Commission finds that the sound level meters, the sound level meter measurement system, including its components such as microphones, and the calibrator used in the sound level survey meet the minimum requirements of Rule 012. These instruments were factory calibrated within the specified period in accordance with the requirements of the rule, and all sound level

³³ Transcript, PDF page 38, lines 21 to 25 and page 39, lines 1 to 12.

³⁴ Exhibit 21191-X0010, Barr SIP letter 2016-03-24, page 1.

³⁵ Exhibit 21191-X0010, Barr SIP letter 2016-03-24.

³⁶ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 219.

³⁷ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 219.

³⁸ Exhibit 21191-X0041, Technical Review, PDF page 17.

meters were both field calibrated before and after the measurement period at each dwelling in accordance with the rule. The Commission also finds that using the manufacturer's insertion loss data for the secondary windscreen followed an acceptable practice.

34. The Commission observes that the March 2015 comprehensive sound level surveys conducted at the Vaughan and Barr dwellings to investigate their concerns did not follow the requirements of Rule 012 and did not capture three-hours of cumulative valid daytime and nighttime data to evaluate compliance with the PSLs. Although Oldman 2 should have discussed the noise concerns of the Barrs and Vaughans with SLR and SLR should have taken these concerns into account when placing the microphones at these dwellings, as noted above, the microphone location at both dwellings was acceptable for purposes of the comprehensive sound level survey.

3.3 Portable meteorological stations

3.3.1 Views of the applicant

35. SLR set up portable weather stations at Receptor E and Receptor L at a height of two metres above ground level to gather five-minute average values of temperature, wind speed, wind direction and relative humidity. SLR indicated that the portable meteorological station at Receptor E was representative of the weather conditions at receptors located above the river valley (i.e., receptors B and C), and the portable meteorological station at Receptor L was representative of the weather conditions at the other receptors located in the river valley (i.e., receptors K and J).

36. Mr. Everton described the locations of the two meteorological stations at Receptor L and Receptor E in relation to the microphone locations, based on review of the site photographs. The portable meteorological station at Receptor E was located 15 metres directly south of the dwelling and approximately 20 to 25 metres east of the microphone, while the one at Receptor L was located approximately 28 metres to the east of the microphone.

37. Mr. Everton was asked whether the portable meteorological stations met the requirements outlined in Table 7 of Rule 012 with respect to height of the anemometer and the distance of the microphone from the anemometer, in relation to all receptor locations in the sound level survey. Mr. Everton responded that the anemometers at receptors E and L were set at a height of two metres and were within 100 metres of the sound level meters at those two locations. That requirement was not strictly met for the other receptor locations;³⁹ anemometers were not located within 100 metres of the sound level meters at the other four dwellings.

38. With respect to representative weather conditions at receptors located above the river valley, Mr. Everton testified that Receptor C and Receptor B were located 1.6 kilometres and 3.6 kilometres respectively from the portable meteorological station at Receptor E and that, in his judgement, the meteorological station at Receptor E sufficiently represented the wind and weather parameters at the other two receptors located above the river valley despite the elevation differences between the three receptors.⁴⁰ With respect to the meteorological station at Receptor L, Mr. Everton testified that Receptor L is sufficiently representative of the two

³⁹ Transcript, PDF page 84, lines 12 to 17.

⁴⁰ Transcript, PDF page 87, lines 11 to 25 and PDF page 88, lines 1 to 22.

receptors, Receptor J and Receptor K at the bottom of the river valley.⁴¹ Mr. Everton stated that Receptor K is located approximately 300 metres from Receptor L, and that Receptor J is located approximately 1.2 kilometres from Receptor L. Mr. Everton added that prevailing winds for the study area are from the west, southwest direction. He explained that in order for all receptors to be in downwind condition, the wind would have to be blowing from the north, which is a rare occurrence.⁴²

39. Oldman 2 provided data to SLR from its on-site meteorological tower including one-minute averaged wind speed and wind direction, relative humidity, and the electrical power output of the nearest wind turbine(s).^{43,44} Mr. Everton testified that “measured ground level wind speeds and directions do not substantially affect measured wind turbine sound levels at the receptor locations. Sound propagation paths are primarily influenced by the wind conditions at higher elevations given the 80-metre hub height of the turbines. Therefore wind conditions at ground level have a less pronounced effect on sound propagation to the receptors.”⁴⁵ Mr. Everton stated that representative conditions exist when the nearest turbine was at or greater than 60 per cent power output of its rated capacity and that representative conditions were adequately obtained.⁴⁶

3.3.2 dBA Consultants’ critique

40. dBA Consultants pointed out that Section 4.7.3 of Rule 012 sets out the anemometer settings and specifications for wind measurement to be used in comprehensive sound level surveys for wind turbines. It stated that the report does not specify the make and model of the anemometer and whether it meets the specifications in the rule. dBA Consultants stated that accurate wind speed and wind direction measurements matter because the noise production of wind turbines increases over a relatively small interval of wind speeds.⁴⁷ It added that it was not clear how it was determined there was no precipitation.

41. dBA Consultants observed that portable meteorological stations were not installed at receptors B, C, J and K and that the requirement in Rule 012 to have anemometers within 100 metres from a microphone was not met.⁴⁸ dBA Consultants also questioned whether the meteorological station at Receptor E was representative of wind and weather conditions at receptors B and C (Hann) based on elevation data.

⁴¹ Transcript, PDF page 88 lines 10 to 19.

⁴² Transcript, PDF page 36, lines 12 to 19.

⁴³ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 11.

⁴⁴ Exhibit 21191-X0018, Information Request Responses, Appendix A Turbine Power, Wind speed & Direction during Representative Conditions, PDF pages 10 to 268 and Appendix B Comparison of Meteorological Data Collected, PDF pages 269 to 323.

⁴⁵ Transcript, PDF page 33, lines 16 to 23.

⁴⁶ Transcript, PDF page 89, lines 4 to 10.

⁴⁷ Exhibit 21191-X0041, Technical Review of OM2 Post-construction CSL Survey, PDF page 18.

⁴⁸ Exhibit 21191-X0041, Technical Review of OM2 Post-construction CSL Survey, PDF page 53.

3.3.3 Commission findings

42. Table 7 of Rule 012 states:

Table 7. Wind measurement instrumentation

#	Description	Setting/specifications
1	Anemometer resolution	0.1 m/s (maximum)
2	Anemometer precision	+/- 0.2 m/s (maximum)
3	Anemometer location	In the direction of the nearest noise sources and within 100 m of the sound level meter with no obstruction in between the anemometer and sound level meter
4	Anemometer height	Same as the microphone of sound level meter
5	Sampling period	10 minutes (maximum)

Note: Allowance for a variance of the location or height specification may be considered. The variance must be documented and justified by the acoustical practitioner in the report.⁴⁹

43. The Commission is satisfied that the portable meteorological stations located at receptors E and L recorded wind speed and direction, temperature, humidity, atmospheric pressure and precipitation. For these receptors, there was no obstruction between the anemometer and the sound level meter and the wind direction was generally from the west and southwest. Accordingly, the above-noted requirements of Rule 012 were met at these receptors. However, for receptors B, C, J and K, no anemometers were placed within 100 metres of the microphone locations as stipulated in Table 7 of Rule 012. The question is therefore whether in these circumstances Oldman 2 has justified that a variance in the anemometer locations is warranted.

44. In light of the distance of portable meteorological stations from receptors B, C, J and K and the local topography of each of the dwellings, the Commission considers that a variation of the location of the anemometer requirement in Table 7 of Rule 012 is not supported. Moreover, the Commission does not accept that the wind speed and direction data collected at the meteorological tower is sufficient in light of Rule 012, which states:

Wind speed and direction information is required at two locations during the monitoring period. One location is at the wind turbine hub height (either the closest turbine upwind from the sound level meter, or at a meteorological tower present within the project) and the other location is in the vicinity of the sound level meter at the monitoring location. This information must be documented.⁵⁰

45. As a result, the Commission is not satisfied that the portable meteorological station at Receptor E is representative of the weather conditions, wind speed and wind direction at receptors located above the river valley (i.e., receptors B and C), nor that the meteorological station at Receptor L (Barr) is representative of the weather conditions, wind speed and wind direction at the other receptors located in the river valley (i.e., receptors J and K). Based on these considerations, the Commission finds that the sound level measurement results at these dwellings (receptors B, C, J and K) are questionable.

⁴⁹ Rule 012, Noise Control, PDF page 26.

⁵⁰ Rule 012, Noise Control, PDF page 28.

3.4 Representative conditions and isolation analysis

3.4.1 Views of the applicant

46. SLR stated that the wind direction during the four nights of the sound survey was typical for the area, being west to west-southwest most of the time.⁵¹ For the purposes of this assessment, SLR considered the appropriate weather conditions to be: no precipitation, prevailing wind direction, wind speeds high enough to spin the wind turbines near their rated power, and ground level winds low enough to cause minimal wind-induced vegetation noise near the microphone locations.⁵² SLR stated that in its professional opinion, the sound level survey captured representative conditions because the wind conditions were typical of the study area and the isolation analysis provided isolated sound levels that represent the noise contributions from the Oldman 2 Wind Farm.⁵³

47. SLR added that during the survey period, the overall energy output from the Oldman 2 Wind Farm ranged from zero MW to 46 MW, or zero per cent to 100 per cent of total capacity, with the energy output being over 90 per cent of capacity 55 per cent of the time, and over 60 per cent of capacity 74 per cent of the time.⁵⁴

48. Moreover, in an information response, SLR stated that:

It is SLR's professional opinion that, after listening to many hours of audio recordings, the wind turbines in this study are quite audible once they reach 60% of their rated output power, and that the sound level beyond this point did not increase substantially as the output power approached 100%. Also, the wind speeds required to produce 80%-100% output cause a very high level of wind noise across the microphone, rendering much of the data invalid.⁵⁵

49. SLR also indicated that it evaluated the energy output for the closest turbine to each monitoring location and only considered data to be valid when the closest turbine was operating over 60 per cent of its rated capacity. Oldman 2 confirmed that all the wind turbines were operating normally and that there were no faults or turbines switched off during the periods used for the noise study.⁵⁶ SLR submitted tables with the nearest wind turbine(s) power output and wind speed and direction in response to information requests.⁵⁷ Mr. Everton confirmed that SLR only used data collected when the nearest wind turbine was operating at the stated capacity of 60 per cent or higher. Mr. Everton testified that although the audibility of the wind turbines was more noticeable during low wind shear, the actual sound power emission of the turbine itself was not increased.⁵⁸

50. With respect to whether a higher (e.g., 70 per cent) output power criteria should be used in determining representative conditions, Mr. Everton stated:

⁵¹ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 11.

⁵² Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 3.

⁵³ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 17.

⁵⁴ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 3.

⁵⁵ Exhibit 21191-X0018, Information Request Responses, PDF page 3.

⁵⁶ Exhibit 21191-X0018, Information Request Responses, PDF page 2.

⁵⁷ Exhibit 21191-X0018, Information Request Responses, PDF pages 10 to 268.

⁵⁸ Transcript, PDF page 91, lines 14 to 17.

We deduced, based on information we received from the manufacturer, that 60 percent was a valid cut-off point for acceptable data in addition to subjective interpretation while undergoing measurements on site.⁵⁹

...

...we believe that 60 percent adequately represents the maximum sound emission of the wind turbine.⁶⁰

51. Mr. Everton did not have any comments on dBA Consultants' view that 50 per cent output power was representative and stated that this might be dBA Consultants' judgment.⁶¹

52. SLR conducted isolation analyses of sound level data collected during the four nighttime periods. The isolation analysis process steps involved the removal of time periods when the nearest turbine was operating below 60 per cent of its rated output, the removal of noise events identified in the noise recordings when the noise was not attributed to the wind turbines and, finally, removing data where the wind turbines could not be heard.⁶² At all monitoring locations, SLR noted that there were periods where the wind turbine(s) were clearly audible and therefore believes the isolated sound levels represent the contributions from the Oldman 2 Wind Farm.⁶³

53. SLR completed isolation analysis for the nighttime period only and compared the isolated sound level data to the nighttime PSLs. With respect to isolation analysis for the daytime period, SLR indicated that the wind turbine contributions do not change appreciably between daytime and nighttime periods and, accordingly, if compliance is shown to the lower nighttime PSL values, compliance with the daytime PSL can be expected. Mr. Everton testified that the acoustic emission of a wind turbine is a function of the hub height wind speed for a particular model of wind turbine and once the sound level reaches a maximum sound emission, the sound level emissions from the turbine remain constant. In relation to the daytime PSLs, Mr. Everton stated:

we're confident that we captured the maximum sound power output of the wind turbines during the nighttime period. We were assured by Mainstream that the operation [of the wind turbines] during daytime and nighttime are identical... there's no reason to believe that the noise environment or the noise emission from the wind farm would be any different or any louder during the daytime than it would be during the nighttime.⁶⁴

...

There's commonly a lot more activity during the daytime, which would require a lot more analysis, a lot more isolation from the data.⁶⁵

We see no reason for the sound emission to be any different during the daytime versus the nighttime.⁶⁶

⁵⁹ Transcript, PDF page 93, lines 9 to 13.

⁶⁰ Transcript, PDF page 94, lines 14 to 15.

⁶¹ Transcript, PDF page 111, lines 19 to 20.

⁶² Exhibit 21191-X0018, Information Request Responses, PDF page 4.

⁶³ Exhibit 21191-X0001, OM2 Post Construction Sound Survey at Six Locations, PDF page 3.

⁶⁴ Transcript, PDF page 51, lines 8 to 17.

⁶⁵ Transcript, PDF page 51, line 25 and PDF page 52, lines 1 to 2.

3.4.2 dBA Consultants' critique

54. dBA Consultants stated that nighttime results show that data for the night with the highest noise impact was not always conducted under representative conditions. Its report indicated that not enough valid data was obtained under downwind conditions at receptors C, E, K and L. dBA Consultants contended that the actual nighttime noise impact may be higher than reported.⁶⁷

55. dBA Consultants pointed out that the daytime period was not analyzed despite several reported exceedances of the daytime PSL of 50 dBA L_{eq} for receptors B, C, K and L.

3.4.3 Commission findings

56. Rule 012 states that “Representative conditions do not constitute absolute worst-case conditions, or the exact conditions the complainant has identified if those conditions are not easily duplicated.”⁶⁸ The Commission has reviewed the electrical power output of the nearest wind turbine(s) for the valid data used in the analysis of the nighttime data collected at each of the six receptor locations and observes that, generally, the nearest wind turbine(s) considerably exceeded the 60 per cent-rated electrical power output. The Commission considers that it is reasonable in these circumstances to use an electrical output of 60 per cent or higher for wind turbines to be operating under representative conditions. Other factors also influence the perception of the sound levels and sound propagation of the wind turbine or turbines at a dwelling (receptor location) such as turbulence, wind shear conditions and rotational speed of the wind turbine rotor. Accordingly, the Commission accepts that the nearest wind turbines were operating under representative conditions.

57. As noted above, the wind direction is generally from the west and west-southwest. Furthermore, in order for all receptors to be in a downwind condition, the wind would have to be blowing from the north, a rare occurrence. The modelling exercise demonstrated a decrease of the sound level by a maximum of 0.5 dBA where cross-wind conditions specific to the receptor locations were applied. In the absence of a formal noise complaint, such modelling is acceptable to the Commission in the specific circumstances of the comprehensive sound level survey.

58. The Commission finds acceptable the isolation analysis performed on the representative nighttime data using audio recordings and field observations.

59. Although isolation analysis was not conducted on any of the daytime data collected at the receptor locations, compliance with daytime permissible sound levels was demonstrated without isolation analysis at receptors E and J over the four-day monitoring period, and at Receptor L and Receptor K on three of the four-day monitoring periods. The Commission acknowledges that these sound levels may demonstrate notional compliance with the daytime PSL without isolation analysis. However, compliance with the daytime PSL was not shown at all receptor locations. In these circumstances, the Commission is not satisfied that the comprehensive sound level survey demonstrates compliance with the daytime PSL.

⁶⁶ Transcript, PDF page 52, lines 9 to 11.

⁶⁷ Exhibit 21191-X0041, Technical Review of OM2 Post-construction CSL Survey, PDF page 53.

⁶⁸ Rule 012, Noise Control, PDF page 26.

3.5 Three hours of cumulative valid data

3.5.1 Views of the applicant

60. In its report, SLR presented summary tables depicting the measured nighttime and daytime sound levels, the isolated nighttime sound levels, and the duration of the valid data. SLR stated that there were sufficient hours of isolated nighttime data at all other receptor locations to determine compliance with Rule 012. Mr. Everton added that because of the noise monitoring challenges presented by wind farms, comprehensive sound level surveys that had less than three hours of cumulative nighttime data throughout various nighttime periods were added together to make up a total of three hours or more of valid data.

61. SLR acknowledged, however, that after the noise monitoring equipment was dismantled and analysis was conducted, it became aware that three hours of cumulative valid data was not collected at Receptor B because of the rattle near the microphone. Mr. Everton testified that “there’s less than 0.5 dBA between the three nights where some valid data was collected.” Mr. Everton added that:

Due to the thorough analysis conducted by Mr. Gaskell, I’m confident that those valid sections of data that were kept in the analysis are, in fact, truly representative of the sound environment at that location. Therefore, I’m comfortable making the professional judgment that any further monitoring at that location would not result in a substantial -- substantially different sound level.⁶⁹

62. Mr. Everton further testified that additional monitoring at Receptor B (Trodden) would not have resolved the issue of obtaining three hours of cumulative valid data because “we felt that we had valid data for five of the six receptors. Our -- again, our cumulative valid nighttime data was 2.6 hours, just shy of three hours, and we felt that this was suitable. And we had no reason to believe that had we returned to the location that we would have measured a different sound level at the receptor.”⁷⁰

63. Further, with respect to Receptor K, Mr. Everton testified that although 3.8 hours of valid data were collected on the night of September 16/17, 2015, three hours of valid data were not collected on the night of September 17/18, 2015.⁷¹

3.5.2 dBA Consultants’ critique

64. dBA Consultants stated in its report that receptors B, E and K did not meet the requirement of three hours of valid representative data during the daytime and nighttime period, specifying that for some receptors, insufficient data was available to meet the AUC criterion of at least three hours of valid data for both daytime and nighttime periods.⁷²

⁶⁹ Transcript, PDF page 97, lines 15 to 22.

⁷⁰ Transcript, PDF page 55, lines 6 to 12.

⁷¹ Transcript, PDF page 96, lines 8 to 14.

⁷² Exhibit 21191-X0041, Technical Review of OM2 Post-construction CSL Survey, PDF page 53.

3.5.3 Commission findings

65. Rule 012 states:

4.1 (4) The number of samples is sufficient in a valid comprehensive sound survey if:

- (a) in the case of a noise complaint or where compliance at a dwelling is in question, at least three cumulative hours of valid data in each nighttime sampling period (10 p.m. to 7 a.m.) and three cumulative hours in each daytime sampling period (7 a.m. to 10 p.m.) under representative conditions are obtained, or⁷³

...

A 24-hour noise sampling period: unless exceptional circumstances are encountered, there must be at least three cumulative hours of valid data (after isolation analysis) in the nighttime sampling period (10 p.m. to 7 a.m.) and three cumulative hours in the daytime sampling period (7 a.m. to 10 p.m.). If exceptional circumstances are encountered, the licensee must provide details of such circumstances and the reasons that these circumstances justify the use of a lesser amount of valid data, or the use of data during upwind or cross-wind directions.⁷⁴

66. The Commission finds as follows with respect to whether the three hours of cumulative data were obtained. At Receptor C, 6.9 cumulative hours of valid nighttime data were obtained on September 17/18, 2015 with a sound level of 52.1 dBA L_{eq} . At Receptor E, 4.2 cumulative hours of valid nighttime data were obtained on September 17/18, 2015 with a sound level of 37.6 dBA L_{eq} . At Receptor J, 4.9 cumulative hours of valid nighttime data were obtained on September 16/17, 2015 with a sound level of 38.2 dBA L_{eq} . At Receptor K, 3.4 cumulative hours of valid nighttime data were obtained on September 16/17, 2015 with a sound level of 38.0 dBA L_{eq} . At Receptor L, 4.4 cumulative hours of valid nighttime data were obtained on September 16/17, 2015 with a sound level of 37.4 dBA L_{eq} . However, at Receptor B, the maximum amount of cumulative valid nighttime data obtained was 1.4 hours collected on September 17/18, 2015.

67. The Commission notes that because no isolation analysis was conducted, the results for daytime periods reflect the entire 15-hour daytime period measured during the comprehensive sound level surveys at the six receptor locations.

68. The Commission finds unpersuasive Mr. Everton's opinion about the collection of valid data at Receptor B because Rule 012 requires that three cumulative hours of valid data be collected. The existence of a rattle near the microphone for the duration of the sound level survey makes the data collected suspect. Consequently, the sound level survey should have been redone prior to the submission of the report.

3.6 Waiver for Receptor C and cumulative effects of energy-related facilities

3.6.1 Receptor C (Hann)

69. The comprehensive sound level survey conducted by SLR concluded that the daytime and nighttime PSLs at Receptor C were not in compliance with Rule 012 because the sound levels at this dwelling, which ranged between 51.1 dBA L_{eq} and 52.1 dBA L_{eq} during the

⁷³ Rule 012, Noise Control, PDF page 17.

⁷⁴ Rule 012, Noise Control, Table 8, PDF page 27.

nighttime period, and between 50.4 dBA L_{eq} and 55.5 dBA L_{eq} during the daytime, exceeded the daytime and nighttime PSLs. For this reason, Oldman 2 requested a waiver to exempt Receptor C from having to comply with the PSLs. Although Oldman 2 withdrew its request for the waiver,⁷⁵ Ms. Hann attended the hearing to request such an exemption.

3.6.2 Views of the applicant

70. Ms. Ribeiro Canella testified as follows:

The owners of the Receptor C, the Hanns, had entered into a surface access and lease agreement with Oldman 2 on August 27, 2009, for the purposes of erecting turbines and related infrastructure on the Hann lands, pursuant to Clause 38 of the lease.

...

the Hanns agreed to decommission their residence within 120 days of receiving written notice to do so.⁷⁶

71. Ms. Ribeiro Canella added that because Oldman 2 had withdrawn the waiver request, notice was given to the Hanns that the dwelling (Receptor C) had to be decommissioned by October 31, 2016, in accordance with the lease agreement.⁷⁷

3.6.3 Views of the intervener

72. Ms. Hann submitted a statement of intent to participate in the hearing that stated that she and her husband had no issues with the turbines or substation located on their property or the results from the noise survey conducted by SLR. The Hanns had asked Mainstream if it was possible for a waiver to be granted if the residence on site were decommissioned.⁷⁸ The Hanns stated that “By decommissioning we have never said, meant, or written that we’d demolish that residence.”⁷⁹ With respect to future plans for the dwelling, Ms. Hann testified that the Hanns have “always planned on going out there.”⁸⁰

73. Ms. Hann acknowledged that she and her husband had agreed to the surface lease. As a result, they would decommission the house and their tenants would be moving out as soon as their new house was available for occupancy, which she believed would be on or about October 31, 2016.⁸¹

74. Ms. Hann testified that she and her husband had not previously received 120 days’ notice to decommission the dwelling.⁸²

⁷⁵ Exhibit 21191-X0035, Withdrawal of Receptor "C" Waiver Request.

⁷⁶ Transcript, PDF page 24, lines 23 to 25 and PDF page 25, lines 1 to 2.

⁷⁷ Transcript, PDF page 23, lines 18 to 20.

⁷⁸ Exhibit 21191-X0039, statement of landowners.

⁷⁹ Exhibit 21191-X0039, statement of landowners.

⁸⁰ Transcript, PDF page 141, lines 6 to 8.

⁸¹ Transcript, PDF page 132, lines 5 to 10.

⁸² Transcript, PDF page 136, lines 9 to 16.

75. Ms. Hann undertook to file a letter with the Commission confirming that the tenants at Receptor C had vacated the dwelling. Email correspondence was received from Ms. Hann on October 31, 2016 in response to the undertaking.⁸³

76. Further, Ms. Hann acknowledged that the dwelling would have to remain vacant for the term of the surface lease agreement.⁸⁴

3.6.4 Commission findings

77. The Commission finds that the sound levels measured at Receptor C (Hann) did not comply with the permissible nighttime levels of 40 dBA L_{eq} nighttime and 50 dBA L_{eq} daytime. The Commission considers that the issue of a waiver for Receptor C is moot because Oldman 2 is not requesting such a waiver and Ms. Hann has acknowledged that the dwelling will not be occupied during the term of the Hanns' surface lease with Oldman 2. In addition, Ms. Hann has confirmed that as of October 31, 2016, the dwelling is no longer occupied.

3.6.5 Cumulative effects of energy-related facilities

78. SLR presented a table summarizing the predicted nighttime sound level contribution of four individual wind farms, the measured isolated nighttime sound levels and cumulative nighttime sound levels for receptors B, C, E, J, K and L in response to an information request.⁸⁵ The existing and approved, but not yet constructed, energy-related facilities identified in the table include Oldman 2 Wind Farm, Heritage Wind Farm, Windy Point Wind Farm and Welsh Wind Farm. In response to questions, Mr. Everton explained that sound levels were measured for the Oldman 2 Wind Farm but that sound levels were predicted based on noise modelling for the other wind farms.⁸⁶ That table, after including provision for approved but not yet constructed wind farms, predicted compliance for all occupied receptors with the exception of Receptor C.

3.6.6 Commission findings

79. Based on the predicted cumulative sound level results presented in response to information request OLDMAN2-AUC-2016MAR15-003, the Commission accepts that the predicted cumulative nighttime sound levels at the receptors other than Receptor C do not exceed the nighttime PSLs. While it accepts these predictions at this time, the Commission considers that the results are subject to future validation once these wind farms are constructed and in operation.

4 Decision

80. Based on the above, the Commission is satisfied that the nighttime PSL was met at Receptor E (Everett) and Receptor L (Barr). The Commission also accepts that at Receptor E compliance with the nighttime period was demonstrated during the nighttime period of September 17/18, 2015 with an isolated nighttime sound level of 37.6 dBA L_{eq} nighttime

⁸³ Email from Ms. Hann dated October 31, 2016, Updating Occupancy of Receptor C.

⁸⁴ Transcript, PDF pages 141 and 142.

⁸⁵ Exhibit 21191-X0018, Information Request Responses PDF page 5.

⁸⁶ Transcript, PDF page 119, lines 8 to 19 and PDF page 120, lines 1 to 21.

(4.2 hours of valid data). For Receptor L, compliance was demonstrated during the nighttime period of September 16/17, 2015 with an isolated nighttime sound level of 37.4 dBA L_{eq} nighttime (4.4 hours of valid data). At both receptors E and L, the daytime periods (without isolation analysis) demonstrate compliance with the daytime permissible sound level. Further, the measurements were taken at these receptors with a portable meteorological station located in accordance with Rule 012. Accordingly, the Commission finds that the comprehensive sound level survey at these two dwellings complies with Rule 012.

81. However, with respect to Receptor B, the comprehensive sound level survey is not acceptable because of the lack of three cumulative hours of valid data during a nighttime period, a portable meteorological station was not placed within 100 metres of a microphone at this dwelling, and the lack of isolated daytime sound level data. Moreover, the sound level survey at Receptor B did not demonstrate compliance with the daytime or nighttime permissible sound level, and less than a minimum of three cumulative valid hours of data was obtained during the four nighttime periods. A longer duration monitoring period might have yielded sufficient samples of valid data for daytime and nighttime conditions to satisfy the requirements of Rule 012. The Commission therefore finds that a follow-up comprehensive sound level survey must be conducted at Receptor B.

82. Although the comprehensive sound level survey at Receptor C did not meet the daytime or nighttime PSLs, this dwelling is now unoccupied and will remain unoccupied. No further sound level survey has to be conducted or any mitigation measures implemented for this dwelling.

83. The Commission finds that the comprehensive sound level surveys at receptors J and K are not acceptable because a portable meteorological station was not placed within a minimum distance of 100 metres from the microphones to accurately document and account for any local meteorological phenomenon that could impact these dwellings. In addition, because no isolation analysis was conducted on the sound levels recorded, no daytime sound levels were established for these dwellings. Accordingly, a follow-up comprehensive sound level survey must be conducted for receptors J and K.

84. As a result, the Commission orders Oldman 2 to conduct a follow-up post-construction comprehensive noise study for receptors B (Trodden), J (Dingreville), and K (Vaughan) under representative conditions to verify that the Oldman 2 Wind Farm complies with Rule 012 during the daytime and nighttime period. Such follow-up noise study must be conducted and filed with the Commission by April 30, 2017.

Dated on December 7, 2016.

Alberta Utilities Commission

(original signed by)

Anne Michaud
Panel Chair

(original signed by)

Kate Coolidge
Acting Commission Member

(original signed by)

Bohdan (Don) Romaniuk
Acting Commission Member

Appendix 1 – Proceeding participants

Name of organization (abbreviation) counsel or representative
Oldman 2 Wind Farm Ltd. N. Bakker I. Ribeiro Canella P. Everton
T. Hann

Alberta Utilities Commission
Commission panel A. Michaud, Panel Chair D. Romaniuk, Acting Commission Member K. Coolidge, Acting Commission Member
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