

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF SOUTH DAKOTA**

**IN THE MATTER OF THE COMPLAINT FILED BY AMBER CHRISTENSON,  
LINDA LINDGREN AND TIMOTHY LINDGREN AGAINST  
CROWNED RIDGE WIND, LLC  
REGARDING PROJECT SOUND LEVEL COMPLIANCE**

**Docket No. CE22-001**

**TESTIMONY  
OF RICHARD LAMPETER**

**August 7, 2023**

1 **INTRODUCTION AND QUALIFICATIONS**

2 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

3 A. My name is Richard Lampeter. My business address is 3 Mill & Main Place, Suite 250,  
4 Maynard, MA 01754.

5

6 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

7 A. I am employed at Epsilon Associates, Inc. (“Epsilon”). I am a Principal at the company  
8 and manage the Acoustics Group.

9

10 **Q. WHAT ARE YOUR RESPONSIBILITIES RELATED TO THE POST-  
11 CONSTRUCTION SOUND STUDIES?**

12 A. I was engaged by Crowned Ridge Wind, LLC (“Crowned Ridge” or “CRW”) to conduct  
13 three (3) post-construction sound studies, including development of protocols for the sound  
14 studies, conducting and supervising the sound studies, and drafting the reports associated  
15 with the three post-construction sound studies.

16

17 **Q. WHAT IS YOUR PROFESSIONAL AND EDUCATIONAL BACKGROUND?**

18 A. I have over 20 years of experience in conducting community sound level impact  
19 assessments. My areas of expertise include the measurement of ambient sound levels,  
20 modeling sound levels from proposed developments, evaluation of conceptual mitigation,  
21 and compliance sound level measurements. I have conducted impact assessments for  
22 power generating facilities, commercial developments, industrial facilities, and transfer  
23 stations. Prior to joining Epsilon, I earned a BS in Environmental Science from Lyndon  
24 State College in 2001.

25

26 Since 2004, I have been involved in renewable energy projects across the United States.  
27 During that time, I provided acoustical consulting on over 80 wind energy projects. I  
28 frequently present key aspects of analyses to boards and committees and have provided  
29 sworn expert testimony.

30

1 I have co-authored several papers ranging in topics from wind energy to metal shredders,  
2 one of which appeared in a peer-reviewed journal, and I am a member of the Institute of  
3 Noise Control Engineering. My resume is attached as Exhibit RL-1.

4  
5 **Q. HAS THIS REBUTTAL TESTIMONY BEEN PREPARED BY YOU OR UNDER**  
6 **YOUR DIRECT SUPERVISION?**

7 A. Yes.

8  
9 **Q. HAVE YOU PREVIOUSLY APPEARED BEFORE THE COMMISSION?**

10 A. Yes, in Docket Nos. EL19-003 and EL19-027.

11  
12 **Q. PLEASE DESCRIBE THE PURPOSE OF YOUR REBUTTAL TESTIMONY.**

13 A. The purpose of my testimony is to address the testimony of Complainant Amber  
14 Christenson.

15  
16 **2020 SOUND STUDY**

17  
18 **Q. PLEASE PROVIDE A BRIEF OVERVIEW OF HOW THE 2020 SOUND STUDY**  
19 **WAS CONDUCTED.**

20 A. In order to address the requirements within the temporary waiver granted on January 9,  
21 2020, a sound level program following the installation of leading edge noise reduction  
22 blades for all Crowned Ridge wind turbines was conducted to evaluate compliance with  
23 the sound level limits within the wind project's permit condition. Prior to the  
24 commencement of the sound level measurement program, a Protocol was developed by  
25 Epsilon and provided to the South Dakota Public Service Commission ("SD PUC" or  
26 "Commission") by Crowned Ridge for review. The Protocol outlined the measurement  
27 methodology, measurement locations, instrumentation, approach for implementing wind  
28 turbine shutdowns, and evaluation criteria to be used in the analysis. On October 2, 2020,  
29 the SD PUC issued an order approving the Protocol.

1 Sound levels were measured at six (6) locations across the interior and at the perimeter of  
2 the Crowned Ridge wind project. The sound level measurement locations were selected  
3 based on the modeled sound levels, proximity of residential locations to the wind turbines,  
4 proximity to other measurement locations in the measurement program, and a complaint.  
5 Continuous programmable unattended sound level meters were placed at these six (6)  
6 locations. These monitors continuously measured sound levels from as early as Tuesday,  
7 October 20, 2020 to Tuesday, November 10, 2020. In addition to the collection of sound  
8 level data, ground-level wind speeds were continuously measured and logged at each  
9 location as per the SD PUC Final Decision. Precipitation was also logged at one location  
10 and used to determine 10-minute periods with precipitation during the measurement  
11 program. The intent of the sound level measurement program was to collect and evaluate  
12 sound data during periods meeting the criteria outlined in the Protocol that would be  
13 representative of worst-case conditions. As discussed in the SD PUC approved Protocol,  
14 the ‘total’ A-weighted  $L_{eq}$  sound level (wind turbines + background) measured during each  
15 of at least 10 periods meeting the conditions specified in the Final Decision were initially  
16 compared to the wind energy facility limits. As necessary, a representative background  
17 sound level was subtracted (on an energy basis) from the operational sound level to obtain  
18 the “wind turbine only”  $L_{eq}$  sound pressure level. The wind turbine only sound pressure  
19 level was then compared to the wind energy facility limits.

20  
21 **Q. PLEASE PROVIDE A BRIEF OVERVIEW OF THE CONCLUSIONS FROM 2020**  
22 **SOUND STUDY.**

23 A. The results of the Epsilon 2020 post-construction measurement program show that sound  
24 pressure levels due to the wind turbines under wind speed and operational conditions  
25 identified as conditions resulting in maximum sound power levels met the sound level  
26 limits set forth in the SD PUC Final Decision for Crowned Ridge at each of the monitoring  
27 locations. The wind turbine only 10-minute  $L_{eq}$  sound levels ranged from 34 to 44 dBA at  
28 the five (5) non-participating monitoring locations and from 42 to 49 dBA at the one (1)  
29 participating monitoring location. The results of this sound level compliance assessment  
30 show (1) that Crowned Ridge Wind was in compliance with the SD PUC sound thresholds  
31 at the measured locations; and (2) because the measured locations were selected due in part

1 to higher modeled sound levels, it follows that participant and non-participant residences  
2 not specifically evaluated during this program will also be below the applicable SD PUC  
3 sound level thresholds.

4  
5 **Q. COMPLAINANT CHRISTENSON (PAGE 2) ASSERTS THAT EQUIPMENT**  
6 **ASSOCIATED WITH ONE OF THE MEASURED LOCATIONS IN THE 2020**  
7 **SOUND STUDY WAS IMPROPERLY PLACED FURTHER FROM THE HOME**  
8 **FOR CROWNED RIDGE'S BENEFIT. CAN YOU DETERMINE WHAT**  
9 **LOCATION SHE IS REFERRING TO?**

10 A. The 2020 Epsilon Sound Study report identifies the position of all measurement locations.  
11 Sound levels were measured approximately 85 feet from the residential structure on the  
12 non-participating parcel located at 46763 159<sup>th</sup> Street which is Location 2. Based on  
13 consultation with the homeowner at this location, the sound level was placed on a different  
14 side of the residence than the previous program.

15  
16 **Q. DO YOU AGREE WITH COMPLAINANT'S ASSERTION THAT EQUIPMENT**  
17 **ASSOCIATED WITH THIS LOCATION WAS PLACED FURTHER FROM THE**  
18 **HOME THAN WAS APPROPRIATE TO BENEFIT CROWNED RIDGE?**

19 A. No. The equipment at Location 2 was not placed further away from the home in order to  
20 benefit Crowned Ridge, but instead was placed at that location in order to be responsive to  
21 the request of the homeowner who requested measurements on a different side of the home  
22 as compared to the previous measurement location while also considering limitations with  
23 respect to vegetation and terrain southeast of the home. Following the 2020 Sound Study  
24 the homeowner entered into a participation agreement, resulting in no additional testing  
25 being necessary at this property. Complainant's concern that there was a fourth property  
26 exceeding sound limits is incorrect, as Location 2 was already identified in Staff expert  
27 David Hessler's report as one of the locations to be over the limit for a very limited time  
28 period.

29

1 **Q. COMPLAINANT CHRISTENSON (PAGE 2) ASSERTS THAT ANSI S12.9, PART**  
2 **3 WAS NOT PROPERLY APPLIED TO THE 2020 SOUND STUDY RESULTS. DO**  
3 **YOU AGREE?**

4 A. No. Although ANSI S12.9 Part 3 describes the procedure identified by the complainant,  
5 this standard pertains to short-term attended measurements and the sound study program  
6 executed by Epsilon in 2020 was mostly unattended. ANSI standard S12.100-2014  
7 discusses the removal of high frequency natural sounds (“HFNS”) from sound level  
8 measurements. The adjustment, called “ANS-weighting”, requires the removal of all  
9 sound level data from octave bands above the 1,000 Hz band. Sound from wind turbines  
10 is generally broadband in nature from the aerodynamic sound caused by the rotating blades.  
11 Therefore, performing ANS-weighting would not only remove HFNS, but, also, would  
12 remove some wind turbine contribution from the measured sound level and be  
13 unrepresentative of the full contribution from the wind project. Therefore, no ANS-  
14 weighting was performed for this sound study or prior post-construction studies performed  
15 for Crowned Ridge.

16  
17 **Q. COMPLAINANT CHRISTENSON (PAGE 2) ASSERTS THAT “NO TRUE**  
18 **TURBINE SOUND PROFILE WAS THUS GATHERED” AT LOCATION 6. DO**  
19 **YOU AGREE?**

20 A. The purpose of the sound study was not to establish a turbine sound profile. Instead,  
21 consistent with the Commission’s Final Decision, the purpose was to evaluate  
22 compliance with the following limit:

23 The Project, exclusive of all unrelated background noise, shall not  
24 generate a sound pressure level (10-minute equivalent continuous  
25 sound level, Leq) of more than 45 dBA as measured within 25 feet  
26 of any non-participating residence unless the owner of the residence  
27 has signed a waiver, or more than 50 dBA (10-minute equivalent  
28 continuous sound level, Leq) within 25 feet of any participating  
29 residence unless the owner of the residence has signed a waiver.

30  
31 The SD PUC’s sound threshold is a broadband, A-weighted, project only sound level limit.  
32 Conservatively, total sound levels were initially compared to the limit. In certain instances,  
33 project-only sound levels were calculated from measured total sound levels by subtracting

1 representative background from measured total sound levels. These project-only sound  
2 levels were then compared to the applicable limit.

3  
4 **Q. COMPLAINANT CHRISTENSON ASSERTS THAT LOCATION 3 (WELDER)**  
5 **WAS OUT OF COMPLIANCE WITH THE COMMISSION'S SOUND**  
6 **THRESHOLDS. PLEASE COMMENT.**

7 A. The results of the 2020 Sound Study show that sound pressure levels due to the wind  
8 turbines under conditions meeting the evaluation criteria established are in compliance with  
9 the SD PUC Final Decision sound level limit of 45 dBA at non-participating residence at  
10 Location 3. Under these conditions, wind turbine only sound levels (Leq) ranged from 38  
11 to 43 dBA. When evaluating additional periods, Staff expert David Hessler identified three  
12 (3) locations with overages. His report concludes that, "In essence, our analysis indicates  
13 that the project sound level was compliant with the stipulated noise limits at Positions 1-3  
14 for 96% of the survey period and for 100% at the remaining positions." With respect to  
15 compliance, David Hessler's report concludes, "Because the overages occurred only once  
16 at only three of the six test positions...we would conclude that the project has been  
17 appropriately designed and is meeting, in good faith, the intent of the permit noise limits."

18  
19 **Q. COMPLAINANT CHRISTENSON (PAGES 1 AND 3) ASSERTS THAT 50% OF**  
20 **THE MEASURED LOCATIONS IN THE 2020 SOUND STUDY FAILED TO**  
21 **COMPLY WITH THE COMMISSION'S SOUND THRESHOLDS. DO YOU**  
22 **AGREE?**

23 A. No, I do not. The results of the Epsilon Sound Study show that sound pressure levels due  
24 to the wind turbines under conditions meeting the evaluation criteria established are in  
25 compliance with the SD PUC Final Decision sound level limit of 50 dBA at participating  
26 residences and 45 dBA at non-participating residences. When evaluating additional  
27 periods, Staff expert David Hessler, identified three (3) locations with overages. As  
28 explained, his report concludes that, "In essence, our analysis indicates that the project  
29 sound level was compliant with the stipulated noise limits at Positions 1-3 for 96% of the  
30 survey period and for 100% at the remaining positions." In addition, his report concludes,

1 “...we would conclude that the project has been appropriately designed and is meeting, in  
2 good faith, the intent of the permit noise limits.”  
3

4 **2021 SOUND STUDY**  
5

6 **Q. COMPLAINANT CHRISTENSON ASSERTS THE 2021 SOUND STUDY WAS**  
7 **NOT CONDUCTED PROPERLY. PLEASE PROVIDE AN OVERVIEW OF HOW**  
8 **THE 2021 SOUND STUDY WAS CONDUCTED.**

9 A. Following the 2020 Sound Study, Crowned Ridge drafted a Mitigation Plan dated March  
10 18, 2021 that was approved by the SD PUC on April 9, 2021. The Mitigation Plan  
11 committed Crowned Ridge to conduct a follow-up sound study. The Order Granting  
12 Petition for Reconsideration and Order Granting Motion to Amend Sound Study Mitigation  
13 Plan in Part on Reconsideration dated September 20, 2021 modified the components of the  
14 follow-up sound study. The 2021 Sound Study was designed to fulfill the requirements of  
15 those Orders.  
16

17 Sound levels were measured at five (5) locations across the interior and at the perimeter of  
18 the Crowned Ridge wind energy center. Three of the five locations (Locations 3A, 7, and  
19 8) were selected as representative of the locations showing sound level exceedances in the  
20 Hessler Report based on proximity to the original locations, modeled sound levels, and  
21 participation status. The additional two locations (Locations 6 and 9) were as ordered by  
22 the SD PUC. Programmable, generally unattended sound level meters were placed at the  
23 five (5) monitoring locations. These monitors continuously measured sound levels from  
24 as early as Tuesday, November 2, 2021 to as late as Thursday, November 18, 2021. In  
25 addition to the collection of sound level data, ground-level wind speeds were continuously  
26 measured and logged at each location as per the Final Decision. Precipitation was also  
27 logged at one location and used to determine 10-minute periods with precipitation during  
28 the measurement program. Epsilon personnel visited each location for observations at least  
29 once every day and checked on the integrity of the monitoring equipment several times  
30 throughout the program. In some cases, a location was visited multiple times in a 24-hour  
31 period depending on operational or meteorological conditions.



1 The intent of the sound level measurement program was to collect and evaluate sound data  
2 per the conditions described in the Mitigation Plan and as modified in the April 9, 2021  
3 and September 20, 2021 Orders with a focus on periods close in time to wind turbine  
4 shutdowns. From the ‘total’ A-weighted  $L_{eq}$  sound levels (wind turbines + background)  
5 measured during periods meeting the conditions specified in the Mitigation Plan,  
6 background sound levels were subtracted (on an energy basis) to obtain the “wind turbine  
7 only”  $L_{eq}$  sound pressure levels. The wind turbine-only sound pressure level was then  
8 compared to the SD PUC sound thresholds. The 2021 sound study was conducted properly  
9 and met the requirements of the SD PUC’s previous orders which detailed the necessary  
10 components of the study.

11  
12 **Q. PLEASE PROVIDE A BRIEF OVERVIEW OF THE CONCLUSIONS FROM 2021**  
13 **SOUND STUDY.**

14 A. The results of the measurement program show that calculated wind turbine only sound  
15 pressure levels, under conditions meeting the established evaluation criteria, comply with  
16 the SD PUC Final Decision sound level limit of 50 dBA at participating residences and 45  
17 dBA at non-participating residences. The wind turbine only 10-minute  $L_{eq}$  sound levels  
18 range from 25 to 45 at the five (5) non-monitoring locations.

19  
20 **Q. COMPLAINANT CHRISTENSON (PAGE 3) ASSERTS THAT THE 2021 SOUND**  
21 **STUDY WAS NOT CONDUCTED CONSISTENT WITH THE COMMISSION**  
22 **APPROVED MITIGATION PLAN. DO YOU AGREE?**

23 A. No, I do not.

24  
25 **Q. COMPLAINANT CHRISTENSON (PAGES 3 AND 5) CLAIMS THE**  
26 **MITIGATION PLAN WAS NOT FOLLOWED BECAUSE THE SOUND STUDY**  
27 **DID NOT COMPLY WITH THE SHUTDOWN REQUIREMENT AND MISSED**  
28 **SHUTDOWNS. PLEASE COMMENT.**

29 A. The Mitigation Plan called for four (4) shutdowns daily at 1:00 a.m., 7:00 a.m., 1:00 p.m.,  
30 and 7:00 p.m. for wind turbines within 1.75 miles of a measurement location.

31

1 A total of 58 shutdowns were coordinated and performed by the NEER Renewable  
2 Operations Control Center during the measurement program targeting 1:00, 7:00, 13:00,  
3 and 19:00 daily. The 58 total shutdowns include three shutdowns specific to Location 6  
4 only, which were conducted at 19:00 on November 17, 1:00 on November 18, and 7:00 on  
5 November 18.

6  
7 For all five (5) measurement locations there were three (3) scheduled shutdowns that were  
8 not implemented, or otherwise delayed; therefore, no evaluations were performed during  
9 these times: November 7 at 1:00 (Daylight Savings Time Change), November 7 at 13:00,  
10 and November 11 at 13:00.

11  
12 Specific to Location 6, there were five (5) additional shutdowns which can be classified as  
13 “missed” as the shutdowns at CRW and CRWII did not occur simultaneously. These were  
14 at 16:00 on November 11, 7:20 on November 12, 7:30 on November 13, 7:10 on November  
15 15, and 7:30 on November 17. This information is presented as part of Table 6-4 of the  
16 2021 Sound Study Report. Due to a typographical error in the report, this table did not  
17 contain the appropriate note for two periods (16:00 on November 11 and 7:20 on November  
18 12). Additionally, an extra shutdown planned at Location 6 for 13:00 on November 17  
19 was not synchronized between CRW and CRWII; therefore, that period could not be used  
20 for additional evaluations.

21  
22 **Q. COMPLAINANT CHRISTENSON (PAGE 3) CLAIMS THE MITIGATION PLAN**  
23 **WAS NOT FOLLOWED BECAUSE THE SOUND STUDY WAS NOT**  
24 **CONDUCTED IN THE FALL OF 2021 DURING SIMILAR WEATHER**  
25 **CONDITIONS TO THE OCTOBER 2020 SOUND STUDY. PLEASE COMMENT.**

26 **A.** A tabulated comparison of the meteorological conditions measured during the October  
27 2020 and the 2021 studies is provided below. Temperatures measured at the onsite  
28 meteorological tower were very similar between the two programs with the same averages.  
29 The 2020 program had more 10-minute periods below freezing, but that program was also  
30 approximately 5 days longer. Wind speeds at hub height were very similar between the

1 program and had strong wind speeds ( $\geq 9$  m/s) for about the same percentage of the  
 2 respective programs.  
 3

	Program Duration	Temperature @ HH (°F)				HH WS (m/s)				GL WS (m/s)			HH WD	WT 38 Output
		Avg.	Max.	Min.	Periods Below Freezing	Avg.	Max.	Min.	Periods $\geq 9$ m/s	Avg.	Max.	Min.	All 16 Sectors?	Range (kW)
2020	~20 Days	40	74	12	1,221 (42%)	9	23	1	1,290 (45%)	3	13	0	Yes	0 to 2300
2021	~15 Days	40	67	21	576 (27%)	9	29	1	983 (46%)	4	14	0	Yes	0 to 2300

4  
 5  
 6 **Q. COMPLAINANT CHRISTENSON (PAGE 3) CLAIMS THE MITIGATION PLAN**  
 7 **WAS NOT FOLLOWED BECAUSE THE SOUND STUDY DID NOT COMPLY**  
 8 **WITH ANSI S12.18 RELATED TO WIND DIRECTION. PLEASE COMMENT.**

9 A. The Mitigation Plan referenced by Complainant does identify specific ANSI standards.  
 10 Condition 26 Part A of the Final Decision reads, “The post construction monitoring survey  
 11 shall be conducted following applicable ANSI methods.” The September 16, 2020  
 12 Protocol states, “The monitoring program will generally follow Method #1: “General  
 13 method for routine measurements” in ANSI S12.18-1994 (R2019) “Procedures for  
 14 Outdoor Measurement of Sound Pressure Level”.”

15  
 16 According to ANSI S12.18, sound level measurements are to be during a wind direction  
 17 under which the measurement location is  $\pm 45$  degrees within the downwind direction of  
 18 the sound source. Evaluating only downwind periods is not a specific requirement  
 19 identified in the conditions of the Final Decision. In addition, according to a 2016  
 20 Massachusetts Clean Energy Center report on wind turbine acoustics, wind direction only  
 21 affects sound levels by “generally less than 1 dB”. Therefore, it is reasonable to include  
 22 additional wind directions in the analysis when downwind periods meeting the other  
 23 criteria are not present and potentially uncommon.  
 24

1 **Q. COMPLAINANT CHRISTENSON (PAGE 3) CLAIMS THE MITIGATION PLAN**  
2 **WAS NOT FOLLOWED BECAUSE THE SOUND STUDY DID NOT USE**  
3 **COMPLIANCE EVALUATION PERIODS WHEN THE FIVE CLOSEST WIND**  
4 **TURBINES WERE OPERATING AND WHEN THE CLOSEST WIND TURBINE**  
5 **WAS AT MAXIMUM SOUND POWER. PLEASE COMMENT.**

6 A. The complainant's assertion that "there was no action by the PUC to remove that  
7 requirement in the 2021 protocol" is incorrect.

8  
9 Based on the findings of the 2020 Epsilon Study, which followed the protocol and  
10 operating condition requirements, no evaluation periods at any of the measurement  
11 locations exceeded the sound level limits. Due to Staff expert David Hessler's inclusion  
12 of additional measurement periods in his review of the 2020 Sound Study, the approach  
13 for selecting evaluation periods was modified as stated in the Mitigation Plan:

14  
15 The sound study will use the protocols approved by the Commission on October 2,  
16 2020, with the following changes:

17 (2) require that the study and report focus on time periods near wind turbine  
18 shutdowns;

19  
20 In both the 2020 and 2021 Sound Studies, a period was only considered for evaluation if  
21 at least the closest 5 wind turbines were operational. The electrical output from these wind  
22 turbines is presented for all periods of all locations in Appendix D of the 2021 Sound Study.  
23 The evaluations conducted in the 2020 Sound Study reviewed only periods when electrical  
24 output at the closest wind turbine was at its rated maximum, *i.e.*, 2,300 kilowatt. This  
25 output was considered to provide 'worst-case' sound levels from the wind turbines.

26  
27 In the review of the 2020 study prepared by Hessler Associates, Inc., Mr. Hessler identified  
28 periods when wind turbines were operating below maximum output with exceedances. In  
29 order to consider periods during which a wind turbine may not be at full power but still  
30 emits elevated sound levels and to minimize uncertainty due to variability in ambient  
31 conditions, the additional sound study was to, "focus on time periods near wind turbine

1 shutdowns.” Therefore, in order to address this requirement of the Mitigation Plan, the  
2 2021 Sound Study did not evaluate all periods during high electrical output regardless of  
3 how many hours they were from the most recent shutdown (this was the approach applied  
4 in the 2020 Sound Study), but instead focused on periods in close proximity to a shutdown.  
5 Although a limitation on the wind turbine power output for evaluation periods was not set,  
6 there were multiple evaluation periods at all 5 locations with a wind turbine only and/or a  
7 total sound level under maximum output conditions at the closest wind turbine.

8  
9 **Q. COMPLAINANT CHRISTENSON (PAGES 5 AND 6) CLAIMS THERE WAS A**  
10 **MISSED SHUTDOWN ON NOVEMBER 11 THAT IMPACTED THE SOUND**  
11 **STUDY’S ABILITY TO DETERMINE COMPLIANCE BECAUSE THE PROJECT**  
12 **WAS RUNNING AT OR NEAR FULL POWER AND THE CONDITIONS WERE**  
13 **COMPARABLE TO THE WELDER LOCATION STUDIED IN THE 2020 SOUND**  
14 **STUDY. PLEASE COMMENT.**

15 A. There was a missed shutdown on November 11 at 13:00. An alternate shutdown was  
16 conducted for four of the five sound level measurement locations at 16:00, and  
17 precipitation was identified during that time period.

18  
19 There were very strong winds on November 11, at 13:00. The wind was from the west  
20 with hub height winds at 18 m/s and the speed at Location 3A was 11 m/s, which is well  
21 above the ANSI threshold for sound measurements. Location 6 is well shielded from  
22 westerly winds, but the trees there generate noise from that wind and impact the levels at  
23 this measurement location. This wind condition was confirmed with a review of the audio  
24 recordings at Location 6, and wind turbine noise was inaudible during adjacent periods.  
25 Therefore, this time period was not critical to the sound level evaluation.

26  
27 **Q. COMPLAINANT CHRISTENSON (PAGES 5 AND 6) ASSERTS THE SOUND**  
28 **STUDY WAS IMPACTED BY PROJECT CURTAILMENTS. PLEASE**  
29 **COMMENT.**

30 A. As stated in the 2021 Sound Study report, MISO curtailments impacted the operation of  
31 the wind turbines. These impacts were limited to periods when curtailments occurred. It

1 is Epsilon's understanding that the curtailments were based on decisions by MISO, were  
2 unscheduled (*i.e.*, dependent upon real time conditions), and were not within the control of  
3 Crowned Ridge operations. Even though these curtailments occurred throughout the  
4 program, a compliance evaluation was able to be conducted. Also as stated in the 2021  
5 Sound Study Report, "the results of the measurement program show that calculated wind  
6 turbine only sound pressure levels, under conditions meeting the established evaluation  
7 criteria, meet the sound level limits set forth in the SD PUC Final Decision for CRW at  
8 each of the measurement locations."  
9

10 **Q. COMPLAINANT CHRISTENSON (PAGE 5) ASSERTS THAT ACTIONS WERE**  
11 **TAKEN TO MANIPULATE THE DATA COLLECTION PROCESS. DO YOU**  
12 **AGREE?**

13 A. No, I do not. Epsilon did not manipulate data collection.  
14

15 **Q. COMPLAINANT CHRISTENSON (PAGES 5-6) CLAIMS THAT THE STUDY**  
16 **PERIOD SHOULD HAVE BEEN EXTENDED BEYOND THE TWO WEEK**  
17 **STUDY PERIOD. PLEASE COMMENT.**

18 A. Since conclusions were able to be drawn regarding compliance with the sound level limits,  
19 an extension beyond the 2-week period was unnecessary.  
20

21 **Q. COMPLAINANT CHRISTENSON (PAGE 6) CLAIMS THAT DATA WAS**  
22 **"CHERRY PICKED" FOR "BLUEBIRD DAYS" AND LOW POWER OUTPUT**  
23 **TIMES. PLEASE COMMENT.**

24 A. The sound level analysis did not involve "cherry picking" periods. Instead, the 2021 Sound  
25 Study performed by Epsilon involved a methodical data analysis procedure described in  
26 the report which followed requirements outlined in the Mitigation Plan. In addition, Mr  
27 Hessler said the following in his report following his review of the study, "Additionally,  
28 we find no faults or errors in Epsilon's final report on the survey and agree with its  
29 conclusions. In fact, Epsilon should be commended for the massive amount of time and  
30 effort that went into properly carrying out this lengthy field survey during difficult  
31 wintertime conditions."

1 **Q. COMPLAINANT CHRISTENSON (PAGE 6) ASSERTS THAT THERE WERE**  
2 **EFFORTS MADE DURING THE SOUND STUDY TO ENSURE THERE WOULD**  
3 **BE NO SHOWING OF ADDITIONAL NOISE OVERAGES. DO YOU AGREE?**

4 A. No, I do not. As I previously stated, the 2021 Sound Study performed by Epsilon involved  
5 a methodical data analysis procedure described in the report which followed requirements  
6 outlined in the Mitigation Plan. In addition, as explained above, Staff expert Hessler  
7 concluded the following in his report following his review of the study, “Additionally, we  
8 find no faults or errors in Epsilon’s final report on the survey and agree with its conclusions.  
9 In fact, Epsilon should be commended for the massive amount of time and effort that went  
10 into properly carrying out this lengthy field survey during difficult wintertime conditions.”  
11

12 **Q. COMPLAINANT CHRISTENSON (PAGE 6) CLAIMS THAT MISSED**  
13 **SHUTDOWNS AND CURTAILMENTS “ROBBED” THE CITIZENS OF**  
14 **VALUABLE SOUND STUDY SAMPLES. DO YOU AGREE?**

15 A. No. There were only a limited number of shutdowns that were missed during the program.  
16 Although curtailments occurred during 10 of the 14 days of the program, there was a  
17 significant range in the duration of the curtailments from 10 minutes to the majority of a  
18 given day. To put the duration into perspective, 19% of the sound level measurements at  
19 Location 6 were during a curtailment. When these curtailments did occur in close  
20 proximity to a shutdown, there were often other factors which would have resulted in  
21 removing the period from the evaluation regardless of wind turbine electrical output, *e.g.*,  
22 precipitation or high winds. Although these curtailments reduced the number of evaluation  
23 periods and/or periods under high electrical output, sufficient data was collected in order  
24 to evaluate compliance with respect to the sound level limits.  
25

26 **Q. COMPLAINANT CHRISTENSON (PAGE 6) ASSERTS THAT EPSILON**  
27 **INDICATED IN THE SOUND STUDY THAT THE CROWNED RIDGE WIND**  
28 **FARM WAS OPERATING ABNORMALLY. PLEASE COMMENT.**

29 A. The 2021 Sound Study Report does not use the “word abnormal” or “abnormally.” The  
30 report does identify the periods that were during a MISO curtailment.  
31

1 **Q. COMPLAINANT CHRISTENSON (PAGE 6) CLAIMS THAT MISSED**  
2 **SHUTDOWNS WERE DURING “HIGH OUTPUT, POTENTIAL ICING**  
3 **PERIODS, AND LONG PERIODS OF CURTAILMENT” ALL OF WHICH**  
4 **IMPACTED THE VALIDITY OF THE SOUND STUDY. PLEASE COMMENT.**

5 A. Specific to Location 6, the missed shutdowns are as follows with context of the conditions  
6 during those times:

- 7 • November 7 at 1:00 – During the early hours of November 7, the winds were strong out of  
8 the south. Audio recordings from Location 6 at the 1:00 AM hour on November 7 include  
9 significant wind and/or tree noise and the wind turbines are inaudible as there were strong  
10 winds from the south. The Leq sound levels during this hour (2nd occurrence with output  
11 data due to DST) ranged from 46 to 47 dBA, which contain significant contribution from  
12 background. The winds decreased slightly over the next hour, and with the closest 5 wind  
13 turbines at maximum output, the Leq sound level at 3:00 AM and 3:10 AM is 43 dBA.  
14 This indicates that CRW conservatively is contributing no more than 43 dBA at this  
15 location and is in compliance.
- 16 • November 7 at 13:00 – Wind turbines were not operating due to light winds at hub height;  
17 therefore, this period did not impact the sound study.
- 18 • November 11 at 13:00 - There were very strong winds at this time. The wind was from the  
19 west with hub height winds at 18 m/s and the speed at Location 3A was 11 m/s, which is  
20 well above the ANSI threshold for sound measurements. Location 6 is well shielded from  
21 westerly winds, but the trees there generate noise from that wind and impact the levels at  
22 the measurement location. This wind condition was confirmed with a review of the audio  
23 recordings, and wind turbine noise was inaudible during adjacent periods. Additionally,  
24 there was measurable precipitation recorded by the National Weather Service; therefore,  
25 no evaluation would have been conducted around this period.
- 26 • November 11 at 16:00 – Period classified as missed because the shutdown was not  
27 synchronized between CRW and CRWII. There were very strong winds at this time. The  
28 wind was from the west with hub height winds at 18 m/s and the speed at Location 3A was  
29 8 m/s, which is well above the ANSI threshold for sound measurements. Location 6 is well  
30 shielded from westerly winds, but the trees there generate noise from that wind and impact  
31 the levels at the measurement location. The audio recording from adjacent periods revealed



1 significant contribution from birds, and wind turbine noise was not discernible.  
2 Additionally, there was measurable precipitation recorded by the National Weather  
3 Service; therefore, no evaluation would have been conducted around this period.

- 4 • November 12 at 7:20 – Period classified as missed because the shutdown was not  
5 synchronized between CRW and CRWII. There was measurable precipitation recorded by  
6 the National Weather Service; therefore, no evaluation would have been conducted around  
7 this period, and therefore this period did not impact the sound study.
- 8 • November 13 at 7:30 – Period classified as missed because the shutdown was not  
9 synchronized between CRW and CRWII. Wind turbines were operating at very low output  
10 around this period due to light winds at hub height; therefore, this period did not impact  
11 the sound study.
- 12 • November 15 at 7:10 – Period classified as missed because the shutdown was not  
13 synchronized between CRW and CRWII. Periods around this time would not have met the  
14 evaluation criteria due to unsteady sound, and therefore this period did not impact the sound  
15 study.
- 16 • November 17 at 7:30 - Period classified as missed because the shutdown was not  
17 synchronized between CRW and CRWII. There were very strong winds at this time. The  
18 wind was from the west with hub height winds at 15 m/s and the speed at Location 3A was  
19 10 m/s, which is well above the ANSI threshold for sound measurements. Location 6 is  
20 well shielded from westerly winds, but the trees along the property line generate noise from  
21 that wind and impact the levels at the measurement location. During adjacent periods the  
22 wind turbine noise was inaudible in the audio recordings.

23 November 17 at 13:00 - Period classified as missed because the shutdown was not  
24 synchronized between CRW and CRWII. There were very strong winds at this time. The  
25 wind was from the west-northwest with hub height winds at 18 m/s and the speed at  
26 Location 3A was 13 m/s, which is well above the ANSI threshold for sound measurements.  
27 Location 6 is well shielded from westerly winds, but the trees generate noise from that  
28 wind and impact the levels at the measurement location. This was confirmed with a review  
29 of the audio recording, and wind turbine noise was not clearly discernible. Therefore, these  
30 missed shutdowns were not critical to the evaluation of the sound level limit. The data

1 collected from the entire site was sufficient to allow for an evaluation of the sound levels  
2 from Crowned Ridge

3  
4 **COMPLAINANT CHRISTENSON'S SOUND MEASUREMENTS**

5  
6 **Q. COMPLAINANT CHRISTENSON (PAGE 2) ASSERTS THAT THE 2021 SOUND**  
7 **STUDY DID NOT APPLY ANSI S12.9, PART 3 TO ELIMINATE THE LEAF**  
8 **RUSTLE AND INSECT NOISE. PLEASE COMMENT.**

9 A. Although ANSI S12.9 Part 3 describes the procedure identified by the complainant, this  
10 standard pertains to short-term attended measurements and this program was mostly  
11 unattended. ANSI standard S12.100-2014 discusses the removal of high frequency natural  
12 sounds (HFNS) from sound level measurements. The adjustment, called "ANS-  
13 weighting", requires the removal of all sound level data from octave bands above the 1,000  
14 Hz band. Sound from wind turbines is generally broadband in nature from the aerodynamic  
15 sound caused by the rotating blades. Therefore, performing ANS-weighting would not  
16 only remove HFNS but also remove some wind turbine contribution from the measured  
17 sound level and be unrepresentative of the full contribution from the project.

18  
19 As already explained, no ANS-weighting was performed for this sound study or prior post-  
20 construction studies performed for Crowned Ridge as it would not have been appropriate  
21 to do so.

22  
23 **Q. COMPLAINANT CHRISTENSON (PAGE 6) CLAIMS THAT THERE WERE**  
24 **TIMES WHEN THE WIND TURBINE THAT MOST AFFECTS SOUND AT HER**  
25 **PROPERTY WAS TURNED OFF. SHE ADDS (PAGE 6) THAT DURING TIMES**  
26 **WHEN THE WIND DIRECTION AND WIND SPEED THAT MOST IMPACTS**  
27 **SOUND AT HER PROPERTY WERE PRESENT THE WIND TURBINE WAS**  
28 **SUDDENLY SHUT DOWN, WHICH RESULTED IN A FLAWED SOUND STUDY.**  
29 **PLEASE COMMENT.**

- 1 A. It is presumed that the comment regarding sudden shutdowns pertains to the unscheduled  
2 MISO curtailments although not all curtailments resulted in the complete shutdown of the  
3 wind turbines. MISO curtailments occurred during potential evaluation periods before or  
4 after the shutdown periods listed below. Additional context regarding the evaluation,  
5 sound levels, and/or meteorological conditions is included below.
- 6 • November 5 at 1:00 – Elevated ambient sound levels (49-56 dBA). Personal  
7 observations at 9:40 indicate wind in trees as primary sound source.
  - 8 • November 5 at 7:00 – Elevated ambient sound levels (49-56 dBA). Personal  
9 observations at 9:40 indicate wind in trees as primary sound source.
  - 10 • November 5 at 13:00 – Elevated ambient sound levels (49-56 dBA). Personal  
11 observations at 9:40 indicate wind in trees as primary sound source.
  - 12 • November 5 at 19:00 – Periods were evaluated in the report.
  - 13 • November 10 at 19:00 – Measurable precipitation onsite.
  - 14 • November 11 at 1:00 – Periods were evaluated in the report.
  - 15 • November 11 at 7:00 - Periods were evaluated in the report.
  - 16 • November 12 at 13:00 – A period was evaluated in the report. Other periods had  
17 unsteady sound.
  - 18 • November 12 at 19:00 – Measurable precipitation by National Weather Service.
  - 19 • November 14 at 1:00 - Periods were evaluated in the report.
  - 20 • November 15 at 19:00 – Hub height wind speeds were low and periods were evaluated in  
21 the report.
  - 22 • November 16 at 1:00 - Periods were evaluated in the report.
  - 23 • November 16 at 7:00 – Most periods had unsteady sound around this period.
  - 24 • November 16 at 13:00 - Most periods had unsteady sound around this period and hub  
25 height wind speeds were generally low.
  - 26 • November 16 at 19:00 - Periods were evaluated in the report.
  - 27 • November 17 at 1:00 - Periods were evaluated in the report.
  - 28 • November 17 at 19:00 – A period was evaluated in the report.
  - 29 • November 18 at 7:00 – Measurable precipitation by National Weather Service.
  - 30

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**Q. COMPLAINANT CHRISTENSON (PAGE 6) CLAIMS THAT EPSILON INCORRECTLY CONCLUDED THAT WIND TURBINE SOUND AT HER PROPERTY WAS MASKED BY BACKGROUND SOUND. PLEASE COMMENT.**

A. In certain instances, the measured total sound levels were within 4.0 dBA of the background sound level. As per ANSI S12.18, the source (wind turbine) sound is identified as “masked” by background sound levels and a wind turbine only level cannot be calculated. This does mean that the wind turbines are completely inaudible, but the contribution of the non-wind turbine sound levels to the total sound level is such that the wind turbine only sound level cannot be isolated under those conditions. Therefore, the term “masked” was used appropriately in the analysis.

**Q. COMPLAINANT CHRISTENSON (PAGES 6-7) CLAIMS THAT THE FIXED POSITION OF THE SOUND MEASURING EQUIPMENT RESULTED IN FAULTY MEASUREMENTS BECAUSE IT WAS LOCATED ON THE EAST SIDE OF HER HOUSE INSTEAD OF THE WEST SIDE, BECAUSE THE WEST SIDE OF HER HOUSE EXPERIENCES HIGH SOUND LEVELS FROM WIND TURBINES. PLEASE COMMENT.**

A. In order to allow for consistency throughout the measurement program a given measurement location should remain static for the duration of the program. The complainant directed Epsilon regarding the original placement of the sound level meter during the 2021 Sound Study. In addition, the complainant had an opportunity to relocate the sound level meter when she requested the meter be placed closer to her home but elected to have it placed the same general area just closer. Given that the residence is over 4,000 feet from the closest wind turbine, placement on the east or west corner of the residence would have no appreciable difference in the sound levels from the wind turbines.

**Q. COMPLAINANT CHRISTENSON (PAGE 7) ASSERTS THAT A WINTER SOUND STUDY SHOULD BE CONDUCTED TO DETERMINE COMPLIANCE WITH THE COMMISSION’S SOUND THRESHOLDS, CLAIMING THAT**

1           **EPSILON CONDUCTED A WINTER STUDY AT A WIND ENERGY PROJECT**  
2           **IN NEW HAMPSHIRE. PLEASE COMMENT.**

3           A.     Epsilon has conducted post-construction sound level measurement programs during a  
4           variety of seasons. It is my understanding that the study complainant Christenson is  
5           referring to is the 2014 Sound Level Assessment Report for the Groton Wind Farm in New  
6           Hampshire. This jurisdiction required both summer and winter testing. Specific to this  
7           New Hampshire program, shutdowns were delayed approximately one week due to the  
8           very cold temperatures at the start of the winter program. The Final Decision for Crowned  
9           Ridge did not require a particular season for post-construction sound level measurements.  
10          The Mitigation Plan has the following requirement for the timing of the sound study:

11  
12                     (4) perform the study in the Fall of 2021 during similar weather patterns and wind  
13                     turbine output ranges that were present in October of 2020.

14  
15          The 2021 Sound Study met this requirement.

16  
17          In addition, sound level measurement programs in the winter introduce additional  
18          challenges which include but are not limited to, freeze/thaw cycles which can impact the  
19          stability of the equipment and can potentially damage the microphone, operational issues  
20          involving the use of electronics in very cold temperatures, properly securing equipment in  
21          deep snow cover, and power concerns related to snow cover and solar panels.

22  
23          Also, according to ANSI S12.18, "Measurements during precipitation or when the ground  
24          is wet or snow covered is highly discouraged."

25  
26          **Q.     DID EPSILON MEASURE SOUND LEVELS AT COMPLAINANT**  
27          **CHRISTENSON'S RESIDENCE DURING THE 2020 SOUND STUDY?**

28          A.     Sound levels were measured on the complainant's property but not at the residence. Sound  
29          levels were measured on the northern property line of the non-participating parcel for  
30          evaluation of the Codington County property line limit. Sound levels were conservatively  
31          evaluated against the limit set forth in the Final Decision at a non-participating residence

1 as opposed to the Codrington County limit of 50 dBA at a property line in the 2020 Sound  
2 Study.

3  
4 **Q. DID EPSILON MEASURE SOUND LEVELS AT COMPLAINANT**  
5 **CHRISTENSON'S RESIDENCE DURING THE 2021 SOUND STUDY?**

6 A. Yes.

7  
8 **Q. WHAT IS THE COMMISSION'S SOUND THRESHOLD FOR A NON-**  
9 **PARTICIPANT, SUCH AS COMPLAINANT CHRISTENSON?**

10 A. The Project, exclusive of all unrelated background noise, shall not generate a sound  
11 pressure level (10-minute equivalent continuous sound level, Leq) of more than 45 dBA as  
12 measured within 25 feet of any non-participating residence.

13  
14 **Q. HAVE YOU FORMED AN OPINION ON WHETHER COMPLAINANT**  
15 **CHRISTENSON'S LOCATION IS COMPLAINT WITH THE COMMISSION'S**  
16 **SOUND THRESHOLD FOR A NON-PARTICIPANT.**

17 A. All of the modeling I have reviewed and post-construction sound level measurement  
18 programs I have conducted show that Crowned Ridge is compliant with the Commission's  
19 sound thresholds as they pertain to Complainant Christenson, and nothing in the Complaint  
20 filed by the Complainants or Complainant Christenson's testimony changes or impacts my  
21 opinion. I do not find that Complainant Christenson's claims of personnel observations on  
22 sound from the wind turbines can outweigh the evidence provided in the 2020 and 2021  
23 sound studies that show her property is well below the Commission's sound thresholds.

24 **Q. BASED ON YOUR REVIEW OF THE COMPLAINT, TESTIMONY, AND**  
25 **EXHIBITS OF THE COMPLAINANTS, HAVE YOU REACHED A CONCLUSION**  
26 **ON WHETHER AN ADDITIONAL SOUND STUDY IS NEEDED TO SHOW**  
27 **CROWNED RIDGE IS IN COMPLIANCE WITH THE SD PUC SOUND**  
28 **STUDIES?**

1 A. Yes, I have. An additional sound study is not needed to show Crowned Ridge is in  
2 compliance with the SD PUC sound studies. As stated in the 2021 Sound Study Report,  
3 “The results of this sound level compliance assessment show (1) that under conditions  
4 when wind turbine sound levels can be accurately calculated, CRW complies with the SD  
5 PUC sound thresholds at the measured locations; and (2) because the measured locations  
6 were selected due in part to higher modeled sound levels, it follows that participant and  
7 non-participant residences not specifically evaluated during this program will also be  
8 below the applicable sound level limit.”

9

10 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

11 A. Yes.

STATE OF MASSACHUSETTS            )  
  ) ss  
COUNTY OF MIDDLESEX            )

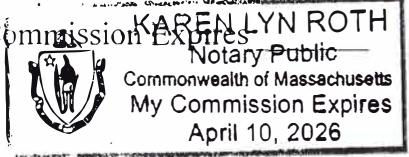
I, Richard Lampeter, being duly sworn on oath, depose and state that I am the witness identified in the foregoing prepared testimony and I am familiar with its contents, and that the facts set forth are true to the best of my knowledge, information and belief.

  
Richard Lampeter

Subscribed and sworn to before me this 3<sup>rd</sup> day of August, 2023.

SEAL

  
Notary Public

My Commission Expires  KAREN LYN ROTH  
Notary Public  
Commonwealth of Massachusetts  
My Commission Expires  
April 10, 2026



**RICHARD M. LAMPETER, INCE**

PRINCIPAL

**EDUCATION**

B.S., Environmental Science, Lyndon State College, 2001

**PROFESSIONAL SUMMARY**

Mr. Lampeter has over 20 years of experience in conducting community sound level impact assessments. His areas of expertise include the measurement of ambient sound levels, modeling sound levels from proposed developments, evaluation of conceptual mitigation, and compliance sound level measurements. Mr. Lampeter has conducted impact assessments for power generating facilities, commercial developments, industrial facilities, and transfer stations. Richard's understanding of acoustical standards and modeling software has allowed him to provide accurate and reliable modeling results to developers and communities.

Since 2004, Mr. Lampeter has been involved in renewable energy projects across the United States. During that time he has provided acoustical consulting on over 80 wind energy projects and has conducted shadow flicker analyses for approximately 50 wind energy projects. In addition to wind energy projects, Mr. Lampeter has conducted sound studies for solar and battery energy storage system projects. Mr. Lampeter frequently presents key aspects of analyses to boards and committees and has provided sworn expert testimony.

At Epsilon, Mr. Lampeter utilizes his diverse skill set as he serves in a variety of rolls on projects, ranging from project manager, to modeler, to field scientist. Richard is adept at using Larson Davis and Norsonic sound level meters and various modeling software packages including, CadnaA and WindPRO. Often meteorological monitoring is a component of sound level measurement programs. For these studies he has utilized Onset's HOBO® and The Meter Group's ATMOS portable weather stations.

Mr. Lampeter has co-authored several papers ranging in topics from wind energy to metal shredders, one of which appeared in a peer-reviewed journal. Mr. Lampeter has been a speaker at CanWEA's annual conference on the topic of low frequency noise from wind turbines and presented shadow flicker guidance and a regulatory update in a New England Wind Energy Education Project webinar.

**PROFESSIONAL EXPERIENCE*****Noise Impact Assessment – Power Projects – Renewable Energy***

◆ *NextEra Energy Resources – Crowned Ridge Wind Energy Center, Grant and Codington Counties, SD.* Provided expert witness testimony to the South Dakota Public Utilities Commission. Led multiple post-construction sound level measurement programs to evaluate compliance with the sound level limits set in the permit conditions for the 200 megawatt wind energy facility.

- ◆ *NextEra Energy Resources – Duane Arnold Solar Project – Phase II, Linn County, IA.* Project Manager for the sound level analysis of a 150 MW solar and battery energy storage system project. Evaluated several project designs. Attended multiple county meetings during the permitting process.
- ◆ *Boreal Renewable Energy Development – Christopher House Wind Turbine Generator Project, Worcester, MA.* Project Manager for a sound level impact assessment prepared for a wind turbine feasibility study. Measured ambient background sound levels and modeled wind turbine sound levels under two scenarios. Impacts were compared to the local zoning ordinance and the Massachusetts Department of Environmental Protection (MassDEP) Noise Policy.
- ◆ *NextEra Energy Resources – Grazing Yak Solar Project, El Paso County, CO.* Project Manager for the sound level analysis of a 35 MW solar project. Operational and construction sound levels were evaluated in the analysis. CadnaA was utilized to evaluate the operational limits and the Roadway Construction Noise Model (RCNM) was utilized to evaluate multiple construction phases.
- ◆ *Tradewind Energy – Aurora Wind Project, Williams County, ND.* Project Manager for the review of a sound level impact assessment prepared for the proposed wind energy project. Provided sworn testimony to the North Dakota Public Service Commission regarding the sound analysis.
- ◆ *NextEra Energy Resources – Tuscola Wind II, Tuscola County, MI.* Project Manager for pre- and post-construction sound level impact assessments for a 100 megawatt (MW) wind energy facility composed of 59 GE wind turbines. Modeling was performed in order to demonstrate compliance with the sound level limits in each community. During multiple public hearings, Mr. Lampeter responded to questions and comments. Following construction, operational sound levels were measured in each of the four townships per ordinance requirements.
- ◆ *Palmer Renewable Energy Project, Springfield, MA.* Predicted future sound levels from a proposed 38 MW renewable biomass energy plant using the CadnaA software package. Impacts were compared to state and local regulations with the results presented in the Environmental Notification Form.
- ◆ *NextEra Energy Resources – Pheasant Run Wind Energy Center, Huron County, MI.* Project Manager for a post-construction sound level compliance evaluation for a wind power generation facility composed of 88 wind turbines and an electrical substation. Sound levels were measured and evaluated at 15 residential locations. Following the submittal of a comprehensive report, results were presented to the Huron County Planning Commission.
- ◆ *Zotos International, Inc. – Two Wind Turbine Project, Geneva, NY.* Conducted a sound level impact assessment for two proposed wind turbines at the existing Zotos International facility. Calculated future sound levels using the CadnaA noise calculation software. Prepared a comprehensive report comparing modeled sound levels to local regulations and relevant criteria. Presented the sound level assessment to the City of Geneva Planning Board.
- ◆ *FPL Energy (now NextEra Energy Resources) – Horse Hollow Wind Energy Center, Taylor County, TX.* Assisted in the development and execution of multiple sound level measurement programs for the 735 MW wind farm which at the time of its in-service date it was the world's largest wind farm.

Analyzed sound level data in conjunction with power output data provided by NextEra Energy Resources and assisted in the preparation for legal proceedings.

- ◆ *Iberdrola Renewables – Groton Wind, Groton, NH.* Assisted in the collection of pre-construction ambient sound levels for a proposed 48 MW wind energy facility. Conducted post-construction sound level measurement programs in order to address the requirements of the State of New Hampshire Site Evaluation Committee Order and the Certificate of Site and Facility with Conditions for the Groton Wind Project. Analyzed the data collected for the evaluation of applicable limits.
- ◆ *NextEra Energy Resources – Lake Benton II Wind Project, Pipestone County, MN.* Project Manager for a sound level assessment for a repower project in Minnesota. The assessment consisted of an ambient measurement program and sound level modeling of the proposed wind turbines and existing wind turbines in the vicinity of the project. The findings were presented in a comprehensive report.
- ◆ *Heritage Sustainable Energy – Big Turtle Wind Farm Phase 2, Huron County, MI.* Project Manager for a pre- and post-construction sound level assessment for a wind energy facility to consisting of 14 Gamesa wind turbines. Sound levels were evaluated with respect to limits in the Huron County Wind Energy Facility Overlay Zoning Ordinance. Presented the results of the post-construction compliance evaluation to the Huron County Planning Commission.
- ◆ *Confidential Project, OK.* Project Manager for a sound level impact analysis. Developed and executed sound level measurement program in response to complaints made by a resident living adjacent to the wind farm. Data were compared to a generally accepted guideline and presented in a letter report.
- ◆ *NextEra Energy Resources – Golden West Wind Energy Center, El Paso County, CO.* Project Manager for multiple post-construction sound level evaluations of 249.4 MW wind power generation facility composed of 145 GE wind turbines. Collected attended and unattended sound level and meteorological data during two measurement programs. Presented the findings of the study to the Board of County Commissioners.
- ◆ *NextEra Energy Resources – Eight Point Wind Energy Center, Steuben County, NY.* Assisted in the sound level modeling for the pre-construction impact assessment required as part of the NY State Article 10 process. Sounds levels were modeled using CadnaA and incorporated CONCAWE meteorology.
- ◆ *NextEra Energy Resources – Lee/DeKalb Wind Energy Center, Lee and DeKalb Counties, IL.* Developed and executed a post-construction sound level measurement program for a 217.5 MW wind farm consisting of 145 GE 1.5xle wind turbines. Over 5,000 hours were collected over a 5-week period at 16 locations. The results of this program found that sound levels due to the wind turbines under worst-case conditions were at or below the Illinois Pollution Control Board noise limits.
- ◆ *FPL – St. Lucie Wind Turbine Generation Project, St. Lucie County, FL.* Assisted in the development and execution of an extensive sound level measurement and modeling program for a proposed wind farm in St. Lucie County, FL. Collected ambient sound level data and meteorological data. Calculated the sound levels resulting from the operation of the wind turbines using the WindPRO modeling software. Six wind turbines were proposed to be constructed along a beach in Florida.

- ◆ *Boreal Renewable Energy Development – Nauset Regional High School Wind Turbine Generator Project, Eastham, MA.* Conducted a sound level impact assessment for a wind turbine feasibility study. Prepared a comprehensive letter report comparing modeled sound levels to the MassDEP Noise Policy.
- ◆ *NextEra Energy Resources – Tuscola Bay Wind Energy Center, Tuscola, Bay, & Saginaw Counties, MI.* Managed a sound level impact assessment for a proposed 120 MW wind power generation facility composed of 75 wind turbines. Modeling was performed in order to demonstrate compliance with the sound level limits in each community. During multiple public hearings, Mr. Lampeter responded to questions and comments. Following construction, operational sound levels were measured as required by the township's ordinance.
- ◆ *NextEra Energy Resources – Jordan Creek Wind Energy Project, Benton & Warren Counties, IN.* Managed a sound level impact assessment for a proposed 146 wind turbine project spanning two counties. Sound level modeling was conducted to evaluate broadband and octave band limits in each county. The analysis was presented in comprehensive reports.
- ◆ *NextEra Energy Resources - Waymart Wind Farm, Waymart, PA.* Executed multiple post-construction sound level measurement programs around the 65 MW wind turbine facility. Analyzed pre- and post-construction sound level data. Summarized data in succinct letter reports.
- ◆ *Iberdrola Renewables – Wild Meadows, Alexandria & Danbury, NH.* Measured ambient sound levels for a proposed 75.9 MW wind energy facility. Sound levels were measured at eight locations representative of nearby residences in various directions from the proposed wind turbines.
- ◆ *NextEra Energy Resources – Pegasus Wind Energy Center, Tuscola County, MI.* Project Manager for a pre-construction acoustic study for a 62 wind turbine project. Both ambient sound level measurements and sound level modeling were components of the project. Presented analysis findings and responded to questions and comments during multiple public hearings.
- ◆ *John Deere Wind Energy – Michigan Wind 1 Wind Farm, Huron County, MI.* Measured and analyzed post-construction sound level data collected to assess compliance with the Huron County noise ordinance and address complaints. The wind farm is a 69 MW project consisting of 46 GE 1.5sle wind turbines. Sound levels were measured at 14 different locations over a 20-day period. Over 4,000 hours of data were collected and analyzed for this program.
- ◆ *Heritage Sustainable Energy – Big Turtle Wind Farm, Huron County, MI.* Project Manager for a sound level compliance evaluation for an existing 20 MW wind energy facility composed of 10 Gamesa wind turbines. Measured sound levels were evaluated with respect to limits in the Huron County Wind Energy Facility Overlay Zoning Ordinance.
- ◆ *Confidential Project, IA.* Project Manager for a sound level impact assessment for a wind farm in Iowa. Predicted future sound levels due to the operation of the wind turbines in areas surrounding the wind farm. Data were presented in tabular format and overlaid onto aerial photography.
- ◆ *NextEra Energy Resources – Osborn Wind Energy Center, MO.* Provided expert opinions regarding proposed amendments to the Clinton County Zoning Ordinance with respect to sound from a

Wind Energy Conversion System. Provided sworn testimony under direct and cross examination at a Clinton County Planning & Zoning Commission hearing.

### **Noise Impact Assessment – Power Projects**

- ◆ *Medical Area Total Energy Plant (MATEP), Boston, MA.* Managed multiple sound level measurement programs for the plant following the installation of two combustion turbines, gas compressors, and cooling towers. These programs included background sound level measurements, compliance operational sound level measurements, and evaluations of noise mitigation. The results of these measurement programs have been summarized in reports submitted to Veolia Energy and regulatory agencies. Assisted in the sound level modeling of a proposed 14.4 MW combustion turbine with a Heat Recovery Steam Generator. Collected sound level data for various rooftop equipment. Conducted post-construction sound level measurements for the evaluation of the MassDEP Noise Policy.
- ◆ *Lean Flame, Watervliet Arsenal, NY.* Project Manager for a sound level impact assessment for a proposed GE Frame 5 gas turbine on land leased from the Watervliet Arsenal. Developed and executed an ambient sound level measurement program. Calculated sound levels at various locations surrounding the site using modeling software. Presented the analysis in a comprehensive report.
- ◆ *Hollingsworth & Vose, Inc. Combined Heat & Power Project, West Groton, MA.* Conducted a sound level impact assessment for the proposed CHP. Sound levels were modeled using the CadnaA noise calculation software. Evaluated multiple project designs. Presented the analysis to the local planning board.
- ◆ *National Grid – East Main Street Substation, Westborough, MA.* Managed a sound level impact assessment for the proposed expansion of a substation. The expansion included the installation of a 115/13.8 kV transformer. Predicted future sound levels were compared to existing sound levels for evaluation with the MassDEP Noise Policy. Presented the analysis in a concise report.
- ◆ *St. Joseph’s Hospital Combined Heat & Power Project, Syracuse, NY.* Measured existing sound levels and conducted a modeling analysis for a project including a Solar Turbines Mercury 50 gas turbine with an electrical output of 4.5 MW and a Heat Recovery Steam Generator capable of producing 45,000 lbs. of steam. Sound levels were evaluated both in the community and in a patient room above the project. Summarized the results of the post-construction sound level measurement program in a concise letter report.
- ◆ *Advanced Power, Brockton Power Project, Brockton, MA.* Performed acoustical modeling for the 350 MW power generating facility using a noise prediction software package. Completed a Best Available Noise Control Technology (BANCT) Analysis which evaluated various noise control options. Assisted in the preparation for the Energy Facilities Siting Board (EFSB) hearings.
- ◆ *Braintree Electric Light Department – Thomas A. Watson Generating Station, Braintree, MA.* Measured sound levels at various locations for a proposed 116 MW natural gas and oil-fired simple cycle electric power generation facility. Assisted in the acoustical modeling, including several rounds of mitigation analyses. Team member for compliance sound level measurement programs.

- ◆ *Milford Power Company, Milford, CT.* Executed an ambient sound level measurement program over a three-day period for a combined cycle electric generating facility proposed in southern Connecticut. Participated in an additional sound level measurement program while construction was under way to collect sound level data during periods of steam venting.
- ◆ *Union College Combined Heat & Power Project, Schenectady, NY.* Conducted an analysis of the sound associated with the operation of a proposed gas-turbine based CHP plant for Bette & Cringe, LLC. The proposed plant will include a gas turbine generator package with an expected nominal gross power output of 1,804 kW. The NY DEC guidance document's 6 dBA increase over ambient limit was used as a guideline in evaluating noise impacts from the project.
- ◆ *Franklin Energy Center, Franklin, MA.* Conducted an ambient sound level measurement program around the Garelick Farms facility in Franklin to establish background sound levels before the construction of the cogeneration plant at the facility. Following construction of the plant, post-construction sound level measurements were taken. Drafted a sound level measurement letter report presenting the results of the program with respect to the Massachusetts Noise Policy.
- ◆ *FPL Energy - Jamaica Bay Peaking Facility, Far Rockaway, NY.* Participated in a sound level measurement program. Short-term and continuous measurements were made at the nearest residences.
- ◆ *Billerica Energy, Billerica, MA.* Assisted in the acoustical modeling using CadnaA for a 480 MW simple cycle turbine facility. Modeled impacts under various scenarios and analyzed noise impacts at multiple locations.
- ◆ *Weaver's Cove Energy, Fall River, MA.* Assisted in the development and implementation of an extensive sound measurement program. Over a three-day period continuous and/or short-term measurements were taken at seven locations around the proposed liquefied natural gas (LNG) terminal. Obtained permission from local residences to install temporary noise equipment. Collected and organized the sound data for this project. Participated in an additional sound level measurement program to collect background sound level data in four communities which were in the vicinity of the proposed offshore berth.
- ◆ *Clifton Street Substation, Marblehead, MA.* Participated in multiple sound level measurement programs. Conducted a baseline noise measurement survey around the existing substation. Conducted a second survey after the existing transformer was replaced to assess compliance with permit conditions. Prepared a letter report summarizing the results.

#### **Noise Impact Assessment – Quarries / Sand & Gravel / Asphalt**

- ◆ *Aggregate Industries, Peabody, MA.* Project Manager for sound level measurement programs developed as part of the Special Permit requirements for the quarry and asphalt plant. Gathered data before and after mitigation measures were implemented, analyzed potential impacts due to a proposed relocation of equipment, and presented results at a Peabody Board of Health Meeting.

- ◆ *McCullough Crushing, Calais, VT.* Collected reference sound level data at an operating sand and gravel pit. Modeled future sound levels due to sand and gravel extraction and processing using CadnaA. Prepared a comprehensive report evaluating potential community noise impacts.
- ◆ *Dalrymple Gravel & Contracting Co., Inc., Erwin, NY.* Measured reference sound levels for an off-road haul truck and associated hopper-loading activities at the existing Scudder Sand and Gravel Pit.
- ◆ *Massachusetts Broken Stone Company, Berlin, MA.* Executed a sound measurement program for an existing asphalt company. Measured sound levels during operational and background conditions. Prepared a letter report summarizing the results.
- ◆ *Ambrose Brothers Inc., Sandwich, NH.* Executed two sound level programs at a sand and gravel excavation site. The first program involved measuring sound levels at the house of a concerned neighbor with a portable crusher at its original location. The second program involved measuring sound levels at the same residence with the crusher at a new location. Prepared letter reports for each of the measurement programs.

#### **Noise Impact Assessment – Industrial**

- ◆ *General Electric Company, Hudson River PCBs Superfund Site, Hudson River, NY.* Assisted in the Phase 1 RAM through the routine collection of sound level data in the community surrounding the dredging activity and processing facility. Collected reference sound level data of noise sources for the project.
- ◆ *Cianbro Corporation – Metal Fabrication Plant, Georgetown, MA.* Conducted an operational sound level measurement program around the existing facility during which sound levels were continuously measured at a property line and sound levels associated with individual operations/equipment were measured at a reference distance. Summarized the program and identified mitigation options in a letter report.
- ◆ *Berwick Iron and Metal Recycling, Berwick, ME.* Modeled a proposed metal shredder at an existing metal recycling facility using CadnaA and proposed mitigation to minimize sound level impacts to the community. Participated in a post-construction sound level measurement program to assess compliance with respect to local sound level limits.
- ◆ *Former Coal Tar Processing Facility, Island End River, Everett, MA.* Participated in multiple sound measurement programs at a former industrial facility. Measured sound levels under existing conditions before and after a pilot study. Measured sound levels at nine locations during a pilot program to generate information about the relationships between dredging operations and their effects on area sound levels. Took individual reference measurements for each of the various types of equipment operated during the pilot study. Collected sound level data during periods of pile driving activity during the sheet pile wall installation phase of the project.
- ◆ *Excel Recycling, Freetown MA.* Conducted attended sound level measurements and detailed sound level modeling to evaluate potential mitigation options for an existing metal shredding and processing facility.

◆ *FedEx Distribution Facility, Billerica, MA.* Conducted a third-party review of a noise study for a proposed distribution facility. The review was performed for BETA Group who was hired by the Town of Billerica. Presented findings at a Billerica Board of Health meeting.

#### **Noise Impact Assessment – Transfer Stations / Landfills**

◆ *Casella Waste Systems, Inc. - Juniper Ridge Landfill, Old Town, ME.* Conducted a sound level impact assessment for the proposed expansion of the existing Juniper Ridge Landfill. The analysis included mobile noise sources associated with the management of solid waste and a new stationary source, the proposed landfill gas to energy facility. Modeled sound levels were evaluated against both state and local regulations.

◆ *Holliston Solid Waste Transfer Station, Holliston, MA.* Participated in a sound level measurement program at a solid waste transfer station in Massachusetts. Coordinated with the transfer station and with local residences on the placement of noise equipment. Weekday and weekend measurements (short-term and continuous) were taken at up to six locations around the facility. Participated in additional sound level measurement programs following the enclosure of the C&D facility to evaluate various mitigation options.

◆ *Hardwick Landfill, Hardwick, MA.* Conducted multiple sound level measurement programs around an existing landfill. Sound levels were measured to evaluate the effectiveness of backup alarm mitigation and to compare levels with and without a gas flare operating. Presented the results of the measurement programs in concise letter reports.

◆ *Resource Recovery of Cape Cod Inc., Sandwich, MA.* Participated in a group effort in conducting two consecutive 12-hour ambient sound level measurements and one 5-hour ambient sound level measurement at multiple locations for a construction & demolition transfer station in Cape Cod. The study was conducted to establish background sound levels around the facility.

#### **Noise Impact Assessment – Institutional**

◆ *Town Hall Renovation, Orleans, MA.* Project Manager for a sound level impact analysis for the renovation of a town hall. Measured existing sound levels at several locations and calculated future sound levels from the proposed mechanical equipment at multiple evaluation points. Following construction and the installation of the new equipment, additional measurements were collected to compare current operational sound levels to background sound levels. All findings were summarized in concise letter reports.

◆ *Institute of Contemporary Art, Boston, MA.* Conducted a sound level measurement program at the future site of the ICA to determine the maximum noise impacts from airplanes taking off from Logan Airport. Coordinated with the Massport Noise Abatement Office to ensure that the desired runway was being used. Gathered detailed information characterizing the noise environment of the site.

◆ *Phillips Academy, Andover, MA.* Measured sound levels with and without the compressor system operating at the new ice hockey facility. Prepared a letter report comparing the results to the Massachusetts Noise Policy.



- ◆ *Harvard University, Boston, MA.* Conducted an ambient sound level measurement program. Sound levels were measured around the proposed Northwest Laboratory.
- ◆ *Northeastern University, Boston, MA.* Conducted an ambient sound level measurement program. The college was interested in constructing an additional building on campus and was concerned about the noise issues related to the project.

#### **Noise Impact Assessment – Commercial / Residential**

- ◆ *Stop & Shop Supermarkets.* Executed ambient sound level programs at numerous supermarket locations in New England. Gathered reference sound level data for mechanical equipment at an existing store. Analyzed the potential for impacts at residences due to the addition of mechanical equipment using the CadnaA noise prediction software.
- ◆ *Washington Village Project, Boston, MA.* Evaluated predicted sound levels for the proposed redevelopment of an approximately 4.89-acre site in the South Boston neighborhood. The redevelopment will include eight new residential buildings with most containing ground floor retail, as well as new streets, plazas, and green spaces. Results of the analysis were presented in an Expanded Project Notification Form (PNF).
- ◆ *110 Broad Street Project, Boston, MA.* Conducted a sound level modeling analysis for the redevelopment of 7,680 square foot site. The project includes the restoration of the historic Bulfinch Building at 102 Broad Street and the construction of a new residential building with ground floor commercial/café space at 110-112 Broad Street. The predicted sound levels were evaluated with respect to the City of Boston noise standards with the results presented in an Expanded PNF.
- ◆ *55 India Street Project, Boston, MA.* Modeled and evaluated sound levels for mechanical equipment associated with a proposed 67,000 square foot building with ground floor commercial space and 44 residential units above. Results were presented in the Expanded PNF.
- ◆ *Parcel 1 Project, Boston, MA.* Analyzed sound level impacts from the mechanical equipment associated with the proposed residential/commercial development located in Boston's historic Bulfinch Triangle. Modeling was performed using CadnaA with the results presented in the Expanded PNF.
- ◆ *Big Y Supermarket, Northampton, MA.* Measured sound levels during normal operations at the supermarket and gathered background sound levels without the supermarket operating.
- ◆ *Crosby's Market, Hamilton, MA.* Measured sound levels around the existing market at the nearest residences in response to concerns by neighbors over the renovation and expansion of the market.
- ◆ *Condominiums, Marblehead, MA.* Measured sound levels during the operation of condenser units located at a condominium. Prepared a letter report comparing the results to the town noise ordinance.

◆ *Banquet Hall, Whately, MA.* Conducted a sound level analysis for a proposed seasonal banquet hall. The noise source of concern was music being played during functions at the hall. Prepared a letter report comparing the modeling results to the MassDEP Noise Policy.

#### **Noise Impact Assessment – Additional Projects**

◆ *Chestnut Ridge Rod and Gun Club, Dover, NY.* Project Manager for a sound level impact analysis at an existing rod and gun club. Devised and executed a sound level measurement program. Developed mitigation strategies and calculated potential future noise impacts. Summarized all findings in a comprehensive letter report.

◆ *Storrow Drive Tunnel Reconstruction Project, Boston, MA.* Collected sound level data at various points along Storrow Drive. Presented the noise impact analysis during an Advisory Committee Meeting.

◆ *TMR Preserve, Dover, NY.* Conducted two sound level programs at a proposed sporting club. Took ambient measurements to document existing conditions in the area. Future conditions were simulated as individuals discharged several types of firearms at various shooting locations in the preserve. Compared measurements taken during these conditions to the existing conditions along with state and local noise regulations.

#### **Shadow Flicker**

◆ *Iberdrola Renewables – Desert Wind, Perquimans and Pasquotank Counties, NC.* Managed a shadow flicker impact assessment for a proposed wind power generation facility to be located in North Carolina. Shadow flicker from the 150 Gamesa G97 2.0 MW wind turbines was calculated. Separate reports were prepared for each county. Gave sworn testimony to the Board of Commissioners in each county.

◆ *NextEra Energy Resources – Tuscola Bay Wind Energy Center, Tuscola, Bay, & Saginaw Counties, MI.* Project Manager for a shadow flicker analysis for a proposed 120 MW wind power generation facility composed of 75 wind turbines. The expected duration of shadow flicker was calculated at sensitive receptors in the vicinity of the project. Responded to questions and comments at multiple public hearings.

◆ *Confidential Project, MA.* Calculated the duration of shadow flicker from a proposed wind turbine to be located in Massachusetts using the WindPRO shadow module.

◆ *State of Connecticut Siting Council, CT.* Contributor to the Epsilon project team providing professional consulting services for renewable energy projects to the Siting Council in CT. Examined analyses conducted, including shadow flicker, for a proposed wind energy project in CT. Reviewed submittals provided by the council and submitted comments.

◆ *State of New Hampshire, Concord, NH.* Conducted an independent review of the shadow flicker analysis for the proposed 24 MW Lempster Mountain Wind Power Project in Lempster, NH. Calculated the duration of shadow flicker using WindPRO software and compared the results to the developer's analysis.

- ◆ *Pioneer Green Energy – Great Bay Wind I, Somerset County, MD.* Calculated the expected annual duration of shadow flicker from a 25-wind turbine project. Multiple layouts and wind turbine types were evaluated for the project. Reductions in shadow flicker due to vegetation were calculated for individual residences. A scaling factor due to curtailments was incorporated into the analysis. The results were presented in a stand-alone report.
- ◆ *NextEra Energy Resources – Golden West Wind Energy Center, El Paso County, CO.* Project Manager for a shadow flicker modeling analysis of an operating 249.4 MW wind power generation facility composed of 145 GE wind turbines. Presented the findings of the study to the Board of County Commissioners.
- ◆ *NextEra Energy Resources – Lake Benton II Wind Project, Pipestone County, MN.* Project Manager for a shadow flicker modeling analysis for a repower project in Minnesota. Shadow flicker modeling was conducted for 44 proposed wind turbines and four alternates.
- ◆ *NextEra Energy Resources – Eight Point Wind Energy Center, Steuben County, NY.* Conducted the shadow flicker analysis for the proposed wind energy project required as part of the NY State Article 10 process. The shadow flicker analysis was performed to determine the location and duration of shadow flicker resulting from the proposed 31 GE wind turbines.
- ◆ *NextEra Energy Resources – Pegasus Wind Energy Center, Tuscola County, MI.* Project Manager for a pre-construction shadow flicker modeling study for a 62 wind turbine project. Provided recommendations for layout adjustments to reduce shadow flicker. Presented analysis findings and responded to questions and comments during multiple public hearings.
- ◆ *Eolian Renewable Energy – Antrim Wind, Antrim, NH.* Conducted a shadow flicker analysis for a proposed 28.8 MW wind power generation facility to be composed of nine (9) Siemens SWT-3.2-113 3.2 MW wind turbines. There were no federal, state, or local regulations limiting the amount of shadow flicker resulting from the operation of the proposed wind turbines for this Project. However, the predicted shadow flicker at occupied buildings in the vicinity of the project were put into context by comparing the annual duration of shadow flicker to a value of 30 hours per year.
- ◆ *Heritage Sustainable Energy – Big Turtle Wind Farm Phase 2, Huron County, MI.* Project Manager for a shadow flicker analysis for a proposed wind energy facility. Shadow flicker resulting from the operation of 15 Gamesa wind turbines was calculated at discrete modeling points and isolines were generated from a grid encompassing the area surrounding the wind turbines.
- ◆ *NextEra Energy Resources – Tuscola Wind II, Tuscola County, MI.* Project Manager for a shadow flicker analysis for a proposed 100 MW wind power generation facility composed of 59 wind turbines. Results were presented in reports for each of the four townships which would have a wind turbine. Responded to questions and comments at multiple public hearings.
- ◆ *Iberdrola Renewables – Blue Creek Wind Farm, Van Wert and Paulding Counties, OH.* Project Manager for a shadow flicker analysis for a proposed wind farm in Ohio consisting of Gamesa G90 2.0 MW wind turbines. Results were presented in a comprehensive report which was submitted to the Ohio Power Siting Board.

- ◆ *First Wind - Weaver Wind, Hancock County, ME.* Sub-consultant to Normandeau Associates for a wind energy project consisting of approximately 15 wind turbines. Shadow flicker modeling was conducted for two options with the results compared to local regulations. The results of the analyses were presented at an Open House for the project.
- ◆ *NextEra Energy Resources – Montezuma Wind Farm, Solano County, CA.* Performed an analysis to estimate the hours per year of shadow flicker in the area surrounding the proposed wind farm. Impacts were presented visually as isolines overlaid onto an aerial image which was included in a concise letter report summarizing the results.
- ◆ *FPL – St. Lucie Wind Turbine Generation Project, St. Lucie County, FL.* Evaluated the potential for shadow flicker impacts at the nearest residences resulting from the operation of six wind turbines proposed as part of this project. Presented the results in a clear and concise report.
- ◆ *NextEra Energy Resources – Osborn Wind Energy Center, MO.* Provided expert opinions regarding proposed amendments to the Clinton County Zoning Ordinance with respect to shadow flicker from a Wind Energy Conversion System. Provided sworn testimony under direct and cross examination at a Clinton County Planning & Zoning Commission hearing.

### **Air Quality Modeling**

- ◆ *Besicorp Empire Development Company, Rensselaer, NY.* Worked on modeling predicting PM<sub>2.5</sub> concentrations from truck and rail traffic associated with a newsprint facility and a cogeneration facility using CAL3QHCR. Produced graphics showing the estimated concentrations in the nearby area.
- ◆ *Alcoa Eastalco Works, Frederick, MD.* Assisted in the modeling of an existing aluminum facility. Worked closely with project managers in developing strategies to accurately address the numerous sources throughout the facility. Assisted in the running of CALMET, CALPUFF, and CALPOST. Developed various graphics to illustrate to the client the results of the modeling.
- ◆ *Storrow Drive Tunnel Reconstruction Project, Boston, MA.* Assisted in a microscale analysis using EPA MOBILE6 and CAL3QHC. Analyzed various reconfiguration scenarios. Presented the mesoscale and microscale analyses during an Advisory Committee Meeting.
- ◆ *Bangor-Hydro Electric Company, Bangor, ME.* Assisted in the renewal process for existing air permits for the Medway, Eastport, and Bar Harbor facilities of the Bangor-Hydro Electric Company. Utilized Satellite i-Steps for generating annual air emission statements.
- ◆ *JAMALCO, Jamaica.* Assisted with the modeling analysis for the Clarendon Alumina Works in Jamaica. ISCST3 was used to model various operating scenarios. Prepared graphics illustrating pollutant concentrations around the facility.
- ◆ *FPL Energy.* Assisted in AERMOD, CALMET, and CALPUFF modeling for a project in Virginia. Gathered and processed data for the project. Helped to create many of the model runs used in the analysis. Created several figures used in the report.

◆ *Columbus Center, Boston, MA.* Assisted in the microscale analysis of seven intersections around a proposed development over the Massachusetts Turnpike. Used ISC-Prime to estimate impacts from point sources and volume sources from proposed buildings and tunnels. Used CAL3QHCR to estimate impacts from mobile sources. These models were used to evaluate each of the four building alternatives. Provided graphics for the project.

#### ***Air Quality Monitoring***

◆ *Massachusetts Broken Stone Company, Berlin, MA.* Participated in an air quality monitoring program for an existing asphalt plant. Assisted in the installation of a meteorological tower. Made routine trips to the facility to maintain and download data from the H<sub>2</sub>S monitor.

◆ *Former Coal Tar Processing Facility, Island End River, Everett, MA.* Participated in an air quality monitoring program for a former industrial facility. Gathered data before and after a pilot study to document existing conditions. Used various types of sampling equipment including SUMMA Canisters and PUF samplers to collect samples during the pilot study.

#### ***Meteorological Monitoring***

◆ *Wheelabrator Millbury Municipal Waste Combustor Facility, Millbury, MA.* Routinely collected data from a meteorological tower at a municipal waste facility. Assisted in the maintenance and calibration of the equipment. Provided quarterly reports.

#### **PROFESSIONAL ORGANIZATIONS**

Institute of Noise Control Engineering (INCE)

#### **PUBLICATIONS**

“Low frequency sound and infrasound from wind turbines.” Noise Control Engineering Journal, Institute of Noise Control Engineering, Volume 59, Number 2, March-April 2011. O’Neal, R.D., Hellweg, Jr., R.D. and R. M. Lampeter.

“Sound Defense for a Wind Turbine Farm.” North American Windpower, Zackin Publications, Volume 4, Number 4, May 2007. O’Neal, R.D., and R.M. Lampeter.

#### **CONFERENCE PAPERS**

“Evaluating and controlling noise from a metal shredder system.” INTER-NOISE 2012, New York City, NY, August 19-22, 2012. O’Neal, R.D., Lampeter, R.M., Emil, C.B. and B.A. Gallant.

“Low frequency sound and infrasound from wind turbines – a status update.” NOISE-CON 2010, Baltimore, MD, April 19-21, 2010. O’Neal, R.D., Hellweg, Jr., R.D. and R. M. Lampeter.

“Nuisance noise and the defense of a wind farm.” INTER-NOISE 2009, Ottawa, Canada, August 23-26, 2009. O’Neal, R.D., and R.M. Lampeter.

**PRESENTATIONS**

“Sound Levels and the Evolving Regulatory Landscape.” AWEA WINDPOWER 2016 Poster Presentation, May 23-26, 2016.

“How to Address Post-Construction Sound Level Measurement Requirements.” AWEA WINDPOWER 2015 Poster Presentation, May 18-21, 2015.

“Evaluating Shadow Flicker in the Current Regulatory Environment.” Massachusetts Wind Working Group, October 30, 2013.

“Shadow Flicker Regulations and Guidance: New England and Beyond.” New England Wind Energy Education Project Webinar, February 10, 2011

“Low Frequency Sound and Infrasound from Wind Turbines.” CanWEA 2010, Montreal, Canada, November 1-3, 2010. O’Neal, R.D., Hellweg, Jr., R.D. and R. M. Lampeter.

**PREVIOUS EMPLOYERS**

NYC Department of Environmental Protection, June - August 2000.

Meyer Strong and Jones Engineers, P.C., May – August 1999.