

1 **STATE OF NEW HAMPSHIRE**

2 **SITE EVALUATION COMMITTEE**

3 **September 22, 2016 - 9:00 a.m.**
 4 Public Utilities Commission
 5 21 South Fruit Street Suite 10
 6 Concord, New Hampshire

DAY 4

Morning Session
ONLY

7 **IN RE: SEC DOCKET NO. 2015-02**
 8 **ANTRIM WIND ENERGY, LLC:**
 9 **Application of Antrim Wind**
 10 **Energy, LLC for a Certificate**
 of Site and Facility.
 (Hearing on the merits)

11 **PRESENT FOR**
 12 **SUBCOMMITTEE:**

SITE EVALUATION COMMITTEE:

13 Cmsr. Robert R. Scott Public Utilities Commission
 (Presiding as Presiding Officer)

14 Cmsr. Jeffrey Rose	Dept. of Resources & Economic Development
15 Dr. Richard Boisvert	Dept. of Cultural Resources/
16 (Designee)	Div. of Historical Resources
17 John S. Clifford	Public Utilities Commission/
17 (Designee)	Legal Division
18 Dir. Eugene Forbes	Dept. of Environ. Services/
18 (Designee)	Water Division
19 Patricia Weathersby	Public Member

20 ***Also Present for the SEC:***

21 Michael J. Iacopino, Esq. (Brennan...
 22 Marissa Schuetz, SEC Program Specialist

23 COURT REPORTER: Steven E. Patnaude, LCR No. 052

24

1
2 **APPEARANCES:** *(as noted by the court reporter)*

3 **Reptg. Antrim Wind Energy (Applicant):**

4 Barry Needleman, Esq. (McLane...)
5 Rebecca S. Walkley, Esq. (McLane...)
6 Henry Weitzner (Antrim Wind Energy)
7 Jack Kenworthy (Antrim Wind Energy)

8 **Reptg. Counsel for the Public:**

9 Mary E. Maloney, Esq.
10 Asst. Atty. General
11 N.H. Attorney General's Office

12 **Reptg. the Town of Antrim:**

13 Justin C. Richardson, Esq. (Upton...)
14 John Robertson, Chairman
15 Robert Edwards, Selectman

16 **Reptg. Harris Center for Conservation
17 Education:**

18 James Newsom, Esq.
19 Stephen Froling, Esq.

20 **Reptg. Audubon Society:**

21 Carol Foss

22 **Reptg. Abutting Landowners Group:**

23 Barbara Berwick, *pro se*

24 **Reptg. Allen/Levesque Group:**

Charles Levesque, *pro se*
Mary Allen, *pro se*

Reptg. Meteorologists Group:

Dr. Fred Ward

Reptg. the Wind Action Group:

Lisa Linowes

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APPEARANCES: (C o n t i n u e d)

Wes Enman, *pro se*

Reptg. Non-Abutting Landowners Group:

Richard Block, *pro se*

Annie Law, *pro se*

Robert Cleland, *pro se*

Elsa Voelcker, *pro se*

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I N D E X

PAGE NO.

WITNESS: ROBERT D. O'NEAL (*resumed*)

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E X H I B I T S

EXHIBIT No.	D E S C R I P T I O N	PAGE NO.
App. 37	DES Letter to Pamela Monroe from Rene Pelletier, Director, Water Division (04-26-16)	6
App. 38	Document by Matt Magnusson entitled "Economic Impact of the Proposed Antrim 30 MW Wind Power Project in Antrim, NH (January 2012)	6
WA-25x	Figure 24: Comparison Between Monitoring Results... (Page 65)	66
WA-26x	Response to Data Requests WA 1-9, WA 1-10, and WA 1-12	66
WA-27x	Letter from State of Maine Dept. of Environmental Protection to Dave Cowan, VP-Environmental Affairs, First Wind (12-18-08)	66
WA-28x	NARUC report entitled "Emissions from Proposed Wind Farm & Measuring the Performance of Completed Projects (October 2011)	66

1 **P R O C E E D I N G**

2 (Before the commencement of this
3 hearing, two documents were
4 provided to the Subcommittee and
5 the Parties and were marked as
6 **Exhibits App. 37** and **App. 38**,
7 respectively, for
8 identification.)

9 PRESIDING OFCR. SCOTT: Good morning,
10 everybody. This is Day 4 of the Antrim SEC
11 hearings. Where we left off was Mr. Ward was
12 questioning Mr. O'Neal. Mr. O'Neal is dealing
13 generally with noise and shadow flicker.

14 Before we go back to Mr. Ward, are
15 there any administrative details that anybody
16 needs to raise before we start this morning?

17 *[No verbal response.]*

18 PRESIDING OFCR. SCOTT: Seeing none.
19 Mr. Ward, so, you and I left -- I think we left
20 off, I was asking --

21 DR. WARD: Let me start, and I think
22 it will take care of what you were saying.

23 PRESIDING OFCR. SCOTT: Yes.

24 DR. WARD: I have followed your

[WITNESS: O'Neal]

1 advice. I've sharpened the questions to a
2 knife edge. There are a few more of them, but
3 the only require "yes", "noes", or "I don't
4 know", most of them. So, I think it's going to
5 go, where as I thought it might go two or three
6 hours, I think we've got it down to maybe an
7 hour and a half, something like that.

8 PRESIDING OFCR. SCOTT: Okay.

9 DR. WARD: So, I followed your
10 advice.

11 PRESIDING OFCR. SCOTT: Thank you.

12 DR. WARD: Okay.

13 PRESIDING OFCR. SCOTT: Proceed.

14 DR. WARD: Okay.

15 (Whereupon **Robert D. O'Neal**
16 resumed the witness stand.)

17 **ROBERT D. O'NEAL, previously sworn**

18 **CROSS-EXAMINATION (resumed)**

19 BY DR. WARD:

20 Q. I want to start with a question that
21 Mr. Needleman asked the witness, about the
22 issue of how far the shadows can be cast. And
23 I believe, and the witness can disagree with
24 this, that there was something about "it just

[WITNESS: O'Neal]

1 didn't matter after a while, because they
2 became indistinct" or "they weren't there" or
3 whatever. Is that a fair characterization of
4 your response?

5 A. I guess I'm not -- I don't recall Mr. Needleman
6 asking me that question.

7 Q. Well, let me ask the question then. There's a
8 limit -- there's a limit in the model, and in
9 some of your testimony I believe was a mile,
10 and I'm just wondering where that comes from?
11 Is there an innate technical reason for it
12 being a mile?

13 A. Well, certainly, the mile is what the SEC rules
14 require.

15 Q. Say again?

16 A. The one mile distance is in the SEC rules.

17 Q. The issue of how far a shadow can be seen,
18 however, would you care to comment if there's a
19 limit on that?

20 A. Sure. I mean, I'll try my best. There's -- in
21 the literature, there's no really bright line.
22 In other words, there's no exact distance where
23 you go from seeing a shadow to not seeing a
24 shadow.

[WITNESS: O'Neal]

1 Certainly, in my experience, if you're
2 going to have a shadow flicker from a wind
3 turbine, it's going to be relatively close to
4 the turbine. As you get further and further
5 away, you have optical depth issues. You know,
6 there's water vapor in the atmosphere, there's
7 all kinds of things in the atmosphere. And any
8 kind of shadow from whether it's a wind turbine
9 or something else will just get more and more
10 diffuse, until eventually you can't see it
11 anymore.

12 Q. You've done a lot of flying, I assume?

13 A. I have flown.

14 Q. Have you ever looked down to the ground at the
15 top of the clouds or the ground and see the
16 outline of the airplane you're flying in?

17 A. Yes.

18 Q. And that could be a mile, two miles,
19 three miles, depending on how high you're
20 flying?

21 A. Yes.

22 Q. So, there doesn't seem to be any limit there?

23 A. I guess what I would say to that is, is I'm
24 looking straight down. It's a different

[WITNESS: O'Neal]

1 optical depth than looking horizontally, in
2 terms of -- in terms of things in the
3 atmosphere.

4 Q. The optical depth doesn't have anything to do
5 with where you're looking down or across, does
6 it?

7 A. I guess, if I'm flying in a plane at
8 35,000 feet, which is approximately seven miles
9 high, I can't see the plane's shadow on the
10 ground. I can see a cloud's shadow on the
11 ground. I can't see a plane's.

12 Q. Have you ever gone to a total solar eclipse?

13 A. I think, when I was much younger, I experienced
14 one.

15 Q. Do you know what causes a total solar eclipse?

16 A. When the moon passes between the Sun and the
17 Earth.

18 Q. And does it cast a shadow on the Earth?

19 A. Yes.

20 Q. From a quarter million miles?

21 A. Yes.

22 Q. Through a total optical depth, which is the
23 entire atmosphere?

24 A. Right.

[WITNESS: O'Neal]

1 Q. And the shadow is still seen?

2 A. Yes.

3 Q. And it still moves?

4 A. Yes.

5 Q. And it's rather sharp?

6 A. It's there.

7 Q. Let me -- do you have a copy of the rules, the
8 definitions, and I'm particularly looking at
9 rule -- the definition for "shadow flicker",
10 which is 102.48?

11 A. I do not have a copy of the rules in front of
12 me.

13 Q. Well, while we're doing that, maybe I'll try
14 another couple of quick questions.

15 PRESIDING OFCR. SCOTT: Before we go
16 on. So, Mr. Needleman, are you providing him
17 with a copy of the rules?

18 MR. NEEDLEMAN: I was -- no.

19 PRESIDING OFCR. SCOTT: Okay. You
20 instantly started to reach for something, and I
21 thought you were reaching to get one.

22 MR. NEEDLEMAN: No. Random timing.

23 DR. WARD: I can give him my --

24 MR. NEEDLEMAN: We can give him --

[WITNESS: O'Neal]

1 (Document handed to the
2 witness.)

3 WITNESS O'NEAL: Thank you.

4 BY DR. WARD:

5 Q. I'm looking at the definition, 102.48.

6 A. Okay. I'm there.

7 Q. Okay. Would you read that please, out loud?

8 A. "Shadow flicker" means the alternating change"
9 -- "changes in light intensity that can occur
10 when the rotating blades of a wind turbine are
11 back-lit by the sun and cast moving shadows on
12 the ground or on structures."

13 Q. Now, is there anything in that that requires
14 clear skies?

15 A. Well, no. You have to have the Sun out,
16 though.

17 Q. I didn't ask that question. I asked "does it
18 require completely clear skies?"

19 A. No, it doesn't.

20 Q. Does it require bright sunshine?

21 A. No.

22 Q. Could the skies be partly to mostly cloudy and
23 still have shadow flicker?

24 A. They could be partly cloudy, sure.

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 Q. This is the Glossary of Meteorology of the
2 American Meteorological Society. And there's a
3 definition in here called "percentage of
4 possible sunshine". Right here [*indicating*].
5 Would you care to read that out loud.

6 A. "Percentage of possible sunshine".

7 Q. Yes.

8 A. "Ratio of the actual duration of bright
9 sunshine to the geographically or
10 topographically possible duration."

11 Q. Did you see the word "bright" in there?

12 A. Yes.

13 Q. Does "bright" appear in the earlier definition
14 that we read?

15 A. No, it does not.

16 Q. Does it, in anywhere in there, discuss whether
17 the sky is cloudy or partly cloudy or partly
18 clear?

19 A. Not in this definition, no.

20 Q. If you use your model, where you're using
21 percent of possible sunshine, which I believe
22 you testified comes from the U.S. Weather
23 Bureau. So, I assume it follows the definition
24 of the American Meteorological Society. Does

[WITNESS: O'Neal]

1 the difference between bright and something
2 else, I guess hazy, whatever it might be,
3 partly cloudy, does that affect the number for
4 the percent sunshine?

5 A. Actually, following our conversation on
6 Tuesday, I went back and did a little more
7 research to confirm what the National Climatic
8 Data Center, which is where we got the data
9 from, from the Weather Service, the "percent of
10 possible sunshine", the way they define it,
11 which is, I guess, slightly different than the
12 AMS definition, they say any day that has --
13 that's "either clear or partly cloudy" is
14 considered, is factored in to the percent of
15 possible sunshine.

16 Q. What database at the NCDC does that go into?
17 I've never read -- I've never seen anything
18 that says "you either collect from the whole
19 day or no day".

20 A. Well, there's different categories. You can
21 have clear skies, partly cloudy skies, or
22 mostly cloudy skies.

23 Q. Oh, yes. They have that as a definition.

24 A. Right.

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 Q. I agree with you.

2 A. Right.

3 Q. I'm talking about the percent sunshine.

4 A. And, in the definitions from NCDC that go with
5 the data tables that we used in our modeling,
6 they're pretty clear that they -- the percent
7 of possible sunshine is days with clear skies
8 or partly cloudy skies. So, in other words,
9 the sun is still coming through, and they call
10 that a "sunny" -- they include that in the
11 percent of possible sunshine.

12 Q. Do you know how they measure that?

13 A. I do not.

14 Q. Have you ever heard of a "sunshine recorder"?

15 A. There's a device called a -- I'm not going to
16 say it quite right, a "pyromometer", I believe,
17 that measures --

18 Q. A pyrometer.

19 A. -- "pyrometer" that measures sunshine. I'm
20 aware of that. I'm not sure of the other
21 device that you're talking about. Unless it's
22 the same thing.

23 Q. Well, the pyrometer measures the amount of
24 energy. They have a thing called a "sunshine

[WITNESS: O'Neal]

1 recorder", and if you would read the definition
2 here. I believe it's right there [indicating].

3 A. A "sunshine recorder": "An instrument designed
4 to record the duration of sunshine without
5 regard to intensity at a given location.
6 Sunshine recorders may be classified in two
7 groups according to the method by which the
8 recorder time scale is obtained. In one class
9 of instruments, the time scale is obtained from
10 the motion of the Sun in the manner of a
11 sundial. In the second class of instruments,
12 the time scale is supplied by a chronograph."

13 MR. IACOPINO: And just what book are
14 you reading that definition from now?

15 WITNESS O'NEAL: This is the
16 "Glossary" --

17 DR. WARD: "Glossary of Meteorology",
18 the early -- the First Edition.

19 MR. IACOPINO: Can you repeat that
20 for the record?

21 WITNESS O'NEAL: It's the "Glossary
22 of Meteorology", from the American
23 Meteorological Society, 1959.

24 MR. IACOPINO: And, just for the

[WITNESS: O'Neal]

1 record, that's a different treatise from which
2 Dr. Ward had you quote from before, is that
3 correct?

4 WITNESS O'NEAL: That's correct.

5 MR. IACOPINO: Thank you.

6 PRESIDING OFCR. SCOTT: Continue.

7 BY DR. WARD:

8 Q. In that definition, the last -- the second one
9 you read, it implied, certainly, that there
10 were more than one kind of sunshine recorder,
11 isn't that not true?

12 A. Yes. That's true.

13 Q. Are you also aware that the way that percent
14 sunshine and the instrument from which it's
15 done has changed over the years?

16 A. Again, I'm not -- I'm not aware of these
17 particular details, no.

18 Q. Okay. Well, let's then just go back to the
19 large Glossary, the one with the -- in the
20 green or blue cover. You saw in there where it
21 said that percent sunshine was "percentage of
22 bright sunshine", did it not?

23 A. That's what it says here, yes.

24 Q. Okay. Now, let's just imagine we're in a place

[WITNESS: O'Neal]

1 where we're taking these recordings. Would we
2 likely end up with more hours per day of
3 sunshine if we included non-bright sunshine
4 than what we get with just bright sunshine?

5 A. I would agree with that, yes.

6 Q. Okay. I don't know how many. I don't have
7 that number. So, I'm not going to ask you
8 that. But we would end up with significantly
9 more day -- I'm sorry, a significantly higher
10 percentage of sunshine if it did not include
11 bright, but it included diffuse or whatever.
12 Do you agree with that?

13 A. I agree.

14 Q. Okay. In your experience, are there quite a
15 number of days that you see that we consider
16 sunny, which are not bright, but diffuse or
17 however you want to describe it?

18 A. Sure.

19 Q. And, so, there would be a lot of hours. We
20 don't -- I don't have the number. So, I'm not
21 trying to sandbag you on that. You would agree
22 there would be a lot of hours. And that, if
23 there were -- if this were done not on bright
24 sunshine, but on sunshine, that the number of

[WITNESS: O'Neal]

1 hours of sunshine recorded by the National
2 Climatic Data Center, that number would be
3 significantly higher than the numbers that we
4 see recorded and which are used in your model,
5 is that true?

6 A. That's not true. Because, as I said just a few
7 minutes ago, the definitions that we obtain
8 from the National Climatic Data Center, which
9 supply the percent possible sunshine that we
10 use in the model, indicate that they included
11 both clear days and partly cloudy days.

12 Q. I don't -- I am probably the National Climatic
13 Data Center's best customer, and I don't ever
14 remember seeing anything like that. But let's
15 go back again, because this is a key issue.

16 If we have the sun, and today is not a bad
17 idea, we've got -- it certainly looks like a
18 sunny day, and yet there's a lot of high clouds
19 out there and the sun is shining through them.

20 Now, if we go back on the definition,
21 which is in the Glossary of Meteorology, and
22 I'm sure I can check to see that that was, in
23 fact, the number -- the technique used. It
24 doesn't mean that they're not taking partly

[WITNESS: O'Neal]

1 cloudy days. You seem to make a difference of
2 that. I don't care whether the day average is
3 partly cloudy, totally cloudy, totally clear or
4 whatever, I'm talking about the hours that the
5 sun is out, are they bright, and how many more
6 hours need to be added to percent sunshine, if
7 you made it so it was just percent sunshine
8 rather than percent bright sunshine?

9 A. I guess the way I'd answer that is, if the
10 National Weather Service records a clear day, I
11 don't know that it matters whether it's a
12 bright sunshine day or it's a clear day. If
13 the sun's out, there's going to be a shadow.
14 And that's the information that we include in
15 the model.

16 Q. Where in the model did you talk about "clear
17 day"? There's a percent sunshine in there. I
18 didn't see anything in that model about
19 "clear"/"partly cloudy days". Did I miss
20 something?

21 A. No. We're not trying to distinguish whether
22 it's a clear day or partly cloudy day. We're
23 just saying "Is the sun out enough to cause a
24 shadow?" That's all.

[WITNESS: O'Neal]

1 Q. It's the number of minutes or hours that it's
2 out that it's bright?

3 A. No, not that it's bright. That it's going
4 to -- that it's clear or partly cloudy and can
5 cause a shadow.

6 Q. I'm not -- then, we're having a problem here.
7 And you keep distinguishing between "clear" and
8 "partly cloudy". We're going to have times
9 today when the sun is going to be out bright.
10 There's going to be times when it's not going
11 to be so much. And there's going to be times
12 in between, where it's not bright, but it's
13 still out. Are there not?

14 A. Yes.

15 Q. I'll let you look out the window, if you need
16 to check.

17 A. I saw it this morning.

18 Q. Okay. So, drawing a distinction about partly
19 cloudy days, I'm including partly cloudy days
20 with bright sunshine off and on. So, it
21 doesn't make any difference whether it's partly
22 cloudy, mostly cloudy, totally clear, I'm only
23 counting the hours of bright sunshine. Am I
24 clear on that?

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 A. Yes.

2 Q. Okay. Now, on those days, whether they're
3 clear, partly cloudy, mostly cloudy or
4 whatever, there will be times when it will be
5 bright and when it will be diffuse. Is that
6 not true?

7 A. Could be true. Could not be true.

8 Q. It would be true, wouldn't it?

9 A. Not if it's -- you could have a cloudy day with
10 no sunshine.

11 Q. Well, how about a half cloudy day? Let's make
12 it very simple. On a half cloudy day, you
13 could have three hours of bright sunshine,
14 three hours of diffuse sunshine, and six hours
15 of cloudiness, couldn't we?

16 MR. NEEDLEMAN: Mr. Chair, I'm going
17 to object. I think that Mr. O'Neal made clear
18 exactly what type of weather data he used in
19 the model.

20 DR. WARD: He's not at all clear, Mr.
21 Chairman. That's what the point of all this
22 questioning is.

23 I hate to make a pun about "clear",
24 but --

[WITNESS: O'Neal]

1 PRESIDING OFCR. SCOTT: Can you just
2 press on, Mr. Ward? And, again, you said
3 "razor sharp" to your point, right? So, --

4 DR. WARD: I'm trying.

5 PRESIDING OFCR. SCOTT: Okay.

6 BY DR. WARD:

7 Q. Let's take a half cloudy day. Wouldn't there
8 be times when it could be totally clear? That
9 is, you get bright sunshine shining on the
10 recorder. Other times when there was nothing
11 on it, and other times when there was enough to
12 make it either click in or not?

13 A. Sure.

14 Q. Okay. So, that in-between set of times are
15 what I would call "non-bright sunshine". Is
16 that a reasonable description of it?

17 A. Okay.

18 Q. Okay. Those hours of non-bright sunshine,
19 whether they're on clear days, partly cloudy
20 days or whatever, those hours are not recorded
21 in the record for percent of total sunshine,
22 are they not?

23 A. I guess I'm going to go back to the same answer
24 that I've given you before. The National

[WITNESS: O'Neal]

1 Climatic Data Center has their definitions,
2 they're pretty clear, no pun intended there.
3 And those percentages are what is reported by
4 each -- by the weather station and what we use
5 in the model.

6 Q. The record -- the recorder will turn on or off,
7 isn't that true?

8 A. I am not familiar with the recording instrument
9 that the Weather Service uses there. So, I
10 really can't comment on that.

11 Q. You read the definition or the story in old
12 meteorological glossary about different
13 instruments and how they did it?

14 A. I did. I mean, that was from a 1959 book. I
15 don't know if that's still what they use,
16 though. I just -- I don't know.

17 Q. In other words, you don't know, we can leave it
18 then, in order to save time, that you don't
19 know the instruments that have been used that
20 go into the record of percent of total
21 sunshine?

22 A. That's correct. And, again, I think that's a
23 reasonable assumption. I'm relying on data
24 from an official Weather Service body. What

[WITNESS: O'Neal]

1 type of instruments they use, I really -- I'm
2 not that concerned about it. Because it gives
3 me the information that's applicable and
4 appropriate to what we're trying to do here.
5 What type of instrument they use, I guess I'm
6 not as concerned about.

7 Q. Well, the reason for my concern, I might as
8 well say it to you, is that the records that
9 you use for percent of total sunshine
10 significantly underestimate the amount of time
11 when you could have a flicker. Because you
12 don't need the full sunshine, it will flicker
13 through high clouds and whatever. And,
14 therefore, the numbers that went into your
15 model, which you claim are official numbers,
16 and they are official numbers, I'm not
17 disputing those. But the definition of those
18 things is not the definition that needs to be
19 fitted into your model. And what it produces,
20 by having it a very totally different number,
21 is that you get numbers for the total sunshine,
22 and the total sunshine correction to the
23 astronomical question of "how many hours of
24 flicker?", which woefully underestimate the

[WITNESS: O'Neal]

1 total number of hours of flicker. And, so,
2 that's why it's important that we either settle
3 that you don't know or you do know whether
4 there's going to be a big difference, a
5 significant difference, between the number of
6 hours which you use from the official record
7 and the actual situation where flicker will
8 happen or be available many more hours of the
9 day. That's where we're trying to get to.

10 So, let me just finish with one question.
11 Is there a difference, in your mind -- well, I
12 should say, do you know whether there's a
13 difference between the record that you use for
14 percent of total sunshine, which you got from
15 the National Climatic Data Center, and the
16 actual hours that the sun and the turbines can
17 make flicker? Do you know whether there's a
18 difference?

19 A. So, yes. Certainly, there is a difference, if
20 you assume 100 percent sunshine every minute
21 the Sun is up, that's the astronomical max that
22 we talked about. That's sort of the worst
23 case. Versus the expected numbers, which
24 assume some percentage of cloudiness, because

[WITNESS: O'Neal]

1 we know the sun doesn't shine every minute of
2 every day here.

3 Q. That's correct.

4 A. And, I guess, to really -- I guess, you asked
5 me a question, and if I could answer it, that
6 would be helpful, I think. You asked me do I
7 think it makes a material difference whether,
8 perhaps, you know, it's -- the NCDC reports
9 say, I think it's -- I will not guess, I will
10 look up a number for you. They say the percent
11 of possible sunshine is --

12 Q. I have similar records. I know what you're
13 referring to.

14 A. -- 62 percent for the month of July, just to
15 pick one month, for example. If I look at the
16 results, the shadow flicker modeling results,
17 which are in the back of the report, and you
18 compare the astronomical maximum, which means
19 it cannot be any more than that.

20 *[Court reporter interruption due*
21 *to perceptible chatter in the*
22 *hearing room.]*

23 *[Brief off-the-record discussion*
24 *ensued.]*

[WITNESS: O'Neal]

CONTINUED BY THE WITNESS:

1
2 A. I think what I was trying to say was, if you
3 look at the astronomical maximum versus the
4 expected, there are 8,760 hours in a year. The
5 difference between the astronomical maximum and
6 the expected is sometimes a matter of five or
7 ten hours, sometimes a matter of one hour. So,
8 I guess what I'm -- how I would answer your
9 question is that, whether it's 62 percent
10 percentage of light, or 64 percentage of light,
11 or 65 percentage of light, year to year, it
12 certainly could vary slightly, absolutely, it's
13 not going to make a material difference in the
14 final answer for expected shadow flicker.

15 BY DR. WARD:

16 Q. So, what you're saying is there isn't enough --
17 there aren't enough hours of non-bright
18 sunshine or sunshine bright enough to cause
19 flicker to make much difference in your
20 calculations. Did I misstate?

21 A. I guess -- I guess where we're having a little
22 difficulty agreeing, perhaps, is you keep
23 throwing out the word "bright sunshine". And
24 the data that I'm relying on does not

[WITNESS: O'Neal]

1 characterize it as "bright sunshine". It just
2 characterizes it as a "sunny day". That's all.

3 Q. I understand that. It's not in -- there's a
4 whole mess of places where different things are
5 said. The meteorological glossary, however,
6 was put together by people who, including
7 people from the National Weather Service, who
8 knew how the recorders worked, okay? Now, we
9 may be able to get in, and, in fact, since one
10 of my meteorologists helped write that, edit
11 that Glossary of Meteorology, I could bring him
12 in and find out where the definition came from.

13 But I'm taking that definition, and I'm
14 saying to you, if that -- maybe I'll rephrase
15 the question.

16 If the definition in the larger one of the
17 two Glossaries of Meteorology, is correct, and
18 that is, in fact, the Weather Bureau's
19 procedures, wouldn't that lead to a serious
20 undercount of the hours of percent sunshine? A
21 serious undercount?

22 A. I don't think so. I really don't.

23 Q. So, your feeling is, on your experience or
24 observation or whatever it is, we don't get

[WITNESS: O'Neal]

1 very many hours where it's sort of hazy? You
2 have sunny, everybody knows it's sunny, it's
3 hot, and --

4 A. No. That's what I'm saying.

5 Q. Well, how could it not be much, unless there's
6 a very few of those cases?

7 A. I guess I'm not -- I don't have anything
8 further to add. Again, the data that the
9 Weather Service records, I'm relying on that.
10 Okay?

11 Q. I rely on it, too. But I know what it means.

12 A. The days that they say it's "clear", "partly
13 cloudy", those all include bright sunshine, I
14 presume. I'm assuming. I don't like to
15 assume, but I'm assuming they do. That's all
16 included in the calculations for flicker here.

17 Q. Have you ever had an opportunity to look at the
18 Observing Handbooks from the National Weather
19 Service, they're about three or four inches
20 thick?

21 A. No.

22 Q. Unfortunately, I have, and never to my -- never
23 to my joy. The Weather Bureau is very clear
24 about what you -- again, sorry -- about what it

[WITNESS: O'Neal]

1 is how things are defined. And I'm not
2 disputing for a second the numbers that you're
3 quoting from the National Climatic Data Center.
4 They are the numbers. The question is, "what
5 do they mean?" And the issue here, and it's
6 crucial for this proceeding that we know what
7 the number of hours are, the correction,
8 so-called, for the non-astronomical number of
9 hours. And that's totally tied up in just two
10 things. One is how often the things are
11 turning, and I assume you have the right number
12 for that. The other very large correction is
13 for the number of hours when you could possibly
14 have had enough sunshine so that flicker would
15 be noticeable. That's what we're talking
16 about, that correction.

17 Your model shows that you use what the
18 Weather Bureau has classified as "percent
19 sunshine". I'm showing you a book which says
20 that that's the percent of "bright sunshine".
21 And that using that woefully underestimates the
22 total amount of sunshine, and hence the number
23 of hours of which you can get flicker. Now,
24 that's going to change the number of hours of

[WITNESS: O'Neal]

1 potential flicker by a substantial amount. I
2 don't know what that amount is. But, on my
3 experience in seeing sunny days, with partly
4 cloudy, non-bright sunshine, it's a big number.

5 A. And that's where I disagree. Again, if you go
6 back and look at the astronomical numbers,
7 those are the maximum possible numbers,
8 assuming a bright sunny day 365 days of the
9 year, you physically could not have any more
10 than that.

11 Q. That's correct.

12 A. Hopefully, we can agree on that.

13 Q. We agree on that.

14 A. Okay. So, you're talking about, if the
15 National Climatic Data Center somehow
16 misrepresents sunshine in their data, and we're
17 far off the mark somehow by using their data,
18 then the expected shadow flicker is that
19 somehow far off the mark.

20 And I'm saying to you, I disagree with
21 that premise. Again, it could be off by a few
22 percentage points at any one time. That's
23 going to translate, though, into no more than
24 probably a few minutes, maybe an hour here, of

[WITNESS: O'Neal]

1 shadow flicker. It's not going to make a -- I
2 forgot the word you used, but a very
3 significant impact here.

4 Q. Are you agreeing with the first part of my
5 premise, which was that there are going to be
6 some, we won't argue the amount at this stage,
7 some cases where it won't be counted as percent
8 sunshine, but it will be enough to make a
9 flicker?

10 A. I'm not going to --

11 Q. Will you give me one hour a year even?

12 A. I'm not going to agree with that, no. Sorry.

13 Q. Why would you not agree with me that there will
14 be times when it's non-bright sunshine, but
15 it's damn well sufficiently bright to cause
16 flicker?

17 A. All I can do is give the same answer. I'm
18 sorry.

19 DR. WARD: Mr. Chairman, I might like
20 to suggest, I can go in and do some analysis of
21 hourly data and things of that nature, and come
22 up with this correction factor to the
23 adjustment factor. And I believe what it will
24 show is that it's a big factor. Such that,

[WITNESS: O'Neal]

1 when they give "52" or "62", that we're really
2 talking about "72".

3 And, whereas their witness is
4 claiming that it's hard to count, it's exactly
5 in proportion to that number. It isn't a
6 little bit, it's exactly in proportion. If it
7 turns out that the number is 10 percent
8 higher, then the number of hours that need --
9 that will allow for shadow flicker go up by
10 that same 10 percent. So, if we're talking
11 about shadow flicker of 8 hours, then this will
12 be 8.8.

13 PRESIDING OFCR. SCOTT: So, Mr. Ward,
14 you've made your point. This is not the place
15 for you to testify. You've had opportunities
16 to file testimony. As I said Tuesday, and,
17 again, you've made the point, I think the
18 Committee understands this, as we said Tuesday,
19 you may not like the answer you're given, but
20 that doesn't mean that it wasn't an answer.

21 So, if you could press on. I think
22 we got your point, though.

23 DR. WARD: Okay.

24 BY DR. WARD:

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 Q. Can we just leave it then, Mr. O'Neal, that
2 there could be an effect, but it isn't
3 particularly relevant for here?

4 A. Again, I'm saying, we used the official data
5 from the National Climatic Data Center. Those
6 are long-term, historical -- historical facts.
7 They're averages. On any given year, could
8 they fluctuate by a percentage point or two?
9 Absolutely. But those are the numbers and
10 those are what I'm standing behind.

11 DR. WARD: Can I have the reporter
12 read back my question?

13 PRESIDING OFCR. SCOTT: I don't think
14 he's set up to do that, are you, Steve?

15 MR. PATNAUDE: I can try --

16 DR. WARD: I asked the question, he
17 didn't answer the question. Let me try it
18 again then.

19 BY DR. WARD:

20 Q. Would you agree that there could be days on
21 which the sunshine recorder didn't record any
22 hours of sunshine, and yet there could have
23 been a lot of hours where there could have been
24 flicker?

[WITNESS: O'Neal]

1 A. I guess I can't answer that, because I don't
2 know the -- I don't understand the recorders
3 that were used at the Weather Service to
4 collect these data. I don't know them. I'm
5 not familiar with them.

6 DR. WARD: I'm finished with that
7 line of questioning, Mr. Chairman.

8 PRESIDING OFCR. SCOTT: Okay.

9 BY DR. WARD:

10 Q. Would you agree that a station sitting in a
11 valley, surrounded by hills, would have a lower
12 possible percentage sunshine, without any
13 corrections? We're talking now about the
14 geometric correction. A station that has hills
15 surrounding it, would that affect the initial
16 calculation of the number of hours at which it
17 potentially has sunshine?

18 A. As compared to what?

19 Q. As compared to flat ground.

20 A. At the same --

21 Q. Surrounded by flat ground.

22 A. At the same latitude, same longitude?

23 Q. Same latitude, same place, without the hills.

24 A. Most likely, yes.

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 Q. Okay. And, if that station were instead at the
2 same latitude, same so forth, but were at the
3 top of a hill, would that affect the number of
4 potential hours of sunshine?

5 A. I guess the only difference up there is -- I
6 mean, whether it's cloudy or partly cloudy or
7 clear, it's going to be pretty much the same.
8 The only difference up there is you may get a
9 little bit more sun, because you're not going
10 to have any topographic blocking by the
11 mountains.

12 Q. Oh, I was asking without the sun brought into
13 it, what could you see, I guess, if everything
14 were totally clear, and you're on top of a
15 hill?

16 A. If everything's totally clear, you're on top of
17 a hill, versus down in a valley? Of course,
18 you're going to see further.

19 Q. Okay. So, I want to shift to a different
20 subject. Would you expect and/or do you know
21 from your experience whether there's a
22 correlation between the amount of the
23 cloudiness and the wind direction?

24 A. In general, there is --

[WITNESS: O'Neal]

1 Q. In Antrim.

2 A. In general, there is, a rough correlation.

3 Q. In what sense?

4 A. For example, if you've got northwesterly winds,
5 that generally indicates you've had some kind
6 of a frontal, you know, a cold front passage
7 typically, and you've got clearing conditions.
8 Northeast winds, you're generally either in or
9 you've got a low pressure system coming up the
10 coast, and you're going to have -- generally
11 have clouds under those conditions.

12 Q. Okay. Well, the reason I ask that is, because
13 in the -- in the top comments about your model,
14 you put in various factors, in which you have
15 wind direction and to show whether the -- how
16 often the turbines will face in certain
17 directions and everything and you have
18 cloudiness. And nowhere in that is there even
19 an acknowledgement that these things are
20 correlated, and hence you can't just put them
21 together. You can't take the averages and put
22 together -- you cannot put together averages of
23 correlated variables and make any reasonable
24 statement about them.

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 Is there anything that I've missed in your
2 report, in your model, which acknowledges that
3 there are lots of correlations between wind
4 direction and cloudiness, and that somehow or
5 other that's accounted for in the model?

6 A. So, the wind direction is a statistical -- a
7 statistical analysis, if you will, by each of
8 the 16 cardinal directions, how often,
9 historically, it blows in those directions.
10 So, you're correct in the sense that that's not
11 matched up in real-time with cloudiness.
12 That's not possible to do on a statistical
13 basis. And, again, that's not -- that's not
14 the intent here, because you're going to have
15 year-to-year variations no matter what.

16 The intent here is to look at some
17 long-term data and understand "what are the
18 likely possibility that this event is going to
19 happen?" And that's what we've done here,
20 using the standard inputs for this software,
21 this model.

22 Q. So, you use the averages or the statistical
23 numbers in the windrows, and then you use the
24 cloudiness from another average. And the

[WITNESS: O'Neal]

1 question I asked was, when you take two sets --
2 two time series of data, and you -- which have
3 a rather substantial correlation, comparisons
4 and uses of these data as if they were separate
5 entities, no statistician would ever try that.
6 Is that -- is there any acknowledgement, in the
7 model and anything you've said, that this
8 correlation could, I'll leave out "would",
9 could substantially affect the numbers that
10 you're working with?

11 A. No, it would not substantially affect the
12 numbers. These are statistical, real data for
13 these two meteorological parameters that we're
14 discussing, the wind direction and the
15 cloudiness, that have been measured for long
16 periods of time. And I would suggest that it's
17 not going to deviate wildly from the
18 calculations because of that very fact. We've
19 got a database that's based on measurements.

20 Q. I never knew that the length of the time
21 series, that getting a longer time series
22 changes the correlation. Is that what you're
23 saying?

24 A. No, it's not what I'm saying.

[WITNESS: O'Neal]

1 Q. Well, how does the length of the time series
2 have any bearing on whether it's correlated and
3 whether that has anything to do with anything?

4 A. As I said, the wind direction information, the
5 cloudiness information, are statistical
6 databases. They are not correlated in time. I
7 said that. I agree with you, they're not
8 correlated in time. However, they're
9 correlated for this location. And they give
10 you an expectation of an event that could
11 happen and when it could happen.

12 Q. I said they were correlated in time. I didn't
13 say they were correlated in space. I said they
14 were correlated in time. And I thought you had
15 agreed with that, that northwest winds
16 generally don't come with lots of clouds?

17 A. I did say that, yes.

18 Q. So, these two time series are correlated in
19 time. And I asked the question, given that
20 correlation, doesn't that affect all the
21 numbers that you've put together?

22 A. I'm sorry. I just -- I don't understand the
23 question.

24 Q. I'll pass on it.

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 (Dr. Ward handing a map to the
2 witness.)

3 BY DR. WARD:

4 Q. This is the USGS map. I assume it's official,
5 but I never know when I buy these things. And
6 this is of the Stoddard and --

7 [Court reporter interruption.]

8 PRESIDING OFCR. SCOTT: He didn't
9 hear you.

10 DR. WARD: Oh, I'm sorry.

11 BY DR. WARD:

12 Q. This is the USGS official map for Stoddard and
13 environs. Okay. Now, would you agree that
14 this is Tuttle Hill/Willard Mountain area?

15 A. I can't see it.

16 Q. This says "Tuttle Hill", "Willard Mountain",
17 that that's the general area where --

18 PRESIDING OFCR. SCOTT: Since you're
19 not on microphone, Mr. Ward, you're going to
20 have to speak loud for everybody.

21 DR. WARD: Okay.

22 **BY THE WITNESS:**

23 A. Yes. That's Tuttle Hill, in Antrim.

24 BY DR. WARD:

[WITNESS: O'Neal]

1 Q. Would you also agree -- I'm speaking to him,
2 but I'm speaking to everybody. Would you also
3 agree that this is State Route 9, through the
4 Town of Stoddard?

5 A. Yes. Yes, I do.

6 Q. Now, State Route 9, if you've driven on it, is
7 a nice road, wide open. There's sections along
8 here [*indicating*] where a driver would be
9 looking straight at the Tuttle Hill/Willard
10 Mountain, through this, and here's Route 9.
11 Would you agree that there are stretches along
12 here where it appears that a driver coming east
13 on Route 9, through Stoddard, would be looking
14 right at that ridge? I'm not arguing whether
15 he'd see it. But he would be, apparently from
16 this, that he would be looking straight at it?

17 A. There is a section of Route 9 where you would
18 be driving in the direction of the hill, yes.

19 Q. And this [*indicating*], and this [*indicating*],
20 and -- I'm not saying it's all of it. I'm just
21 saying there are a lot of sections along here.
22 And I will add that the Route 9, at that stage,
23 is a 55 mile-an-hour road.

24 Now, in order to determine whether we're

[WITNESS: O'Neal]

1 going to get sunshine and shadow flicker on
2 sections of that road, we would need to do an
3 analysis like in the model that you have for
4 showing where shadow flicker is, is that not
5 true?

6 A. True.

7 Q. So, it could be run?

8 A. You could run anything.

9 Q. No, no. I don't have the model, nor can I get
10 it. I'm saying, it could be run to determine
11 whether there's going to be shadow flicker
12 directed in the eyes of the drivers coming
13 along, going east on Route 9, in Stoddard?

14 A. Well, I mean, there's a couple answers for
15 that. Number one, it's -- I'm looking for a
16 scale here.

17 Q. It's all down in the bottom.

18 A. Yes.

19 Q. This is the mileage scale. And this is north
20 *[Indicating]*, I guarantee you that.

21 A. So, that section of the road is many miles away
22 from the Project, certainly way, way beyond the
23 one mile area of interest that the SEC is
24 concerned about. I really can't comment

[WITNESS: O'Neal]

1 whether there would be any shadow flicker at
2 all that far away. It's highly unlikely.

3 Q. So, what you're saying is that the distance
4 factor eliminates any question of shadow
5 flicker in the eyes of any drivers?

6 A. I would not be concerned that far away.

7 Q. Would you agree that the model could be run to
8 determine when that happened?

9 A. The model could be run? Again, at that
10 distances -- that distance, it really doesn't
11 make a whole lot of sense.

12 Q. I didn't ask the question. It could be run,
13 could it not?

14 A. Physically, it could be run, yes.

15 Q. Okay. It hasn't been, as far as you know?

16 A. That's correct.

17 Q. Okay. When we're talking about shadow flicker,
18 going back to the definition of it, there isn't
19 anything in that definition which, however,
20 precludes shadow flicker extending out some
21 distance, the 102.48?

22 A. The definition does not discuss distance, no.

23 Q. So, if the question were to come up, as to
24 whether that could be a potential problem, a

[WITNESS: O'Neal]

1 safety problem, it could be run?

2 A. As I said, as I already told you, yes, it could
3 be run.

4 Q. All right. Thank you. Would the reflection of
5 shadows off ice or ice-covered surfaces, or any
6 highly reflective surfaces, could that lead to
7 casting moving shadows on structures, and hence
8 fulfill the requirements of 102.48?

9 A. I'm not sure I understand physically what
10 you're talking about. Can you explain it more?

11 Q. Yes. If there were reflections off ice-covered
12 surfaces or other highly reflective surfaces,
13 such as to cast moving shadows on structures,
14 the reflection casting moving shadows on
15 structures, would that fulfill the requirements
16 of 102.48 in being shadow flicker? If you
17 don't know the answer to that -- I don't know
18 either, I have to tell you that.

19 A. I have never seen a shadow reflected off, you
20 know, ice-covered ground.

21 Q. Would you repeat that.

22 A. I haven't seen a shadow reflected off the
23 ground and then hitting somewhere else, which I
24 think is the scenario you were asking me about.

[WITNESS: O'Neal]

1 Q. Okay. We'll move on. Is icing in Antrim, New
2 Hampshire a frequent occurrence, at the ground?

3 A. We didn't study icing specifically. I'd hazard
4 to give you any kind of a real specific
5 meteorological answer. It certainly happens
6 here in the Northeast occasionally.

7 Q. How about on top of Mount Washington, in New
8 Hampshire?

9 A. I'm not sure how that's relevant for Antrim. I
10 know, sure, icing occurs on top of Mount
11 Washington. I've seen the pictures.

12 Q. The reason it's relevant is that we don't have
13 a good weather station at 2,000-2,500 feet.
14 Unless you know of one?

15 A. No.

16 Q. So, I'm trying to get at, how would you know
17 the frequency of occurrence of icing on the
18 blades of a turbine in the 2,000 plus elevation
19 range? I'm curious as to how you got it?

20 A. Again, I didn't do an analysis on icing of the
21 blades.

22 Q. So, you don't know how frequent that would be?

23 A. I don't. I think somebody else on the team did
24 that, but we did not do it.

[WITNESS: O'Neal]

1 PRESIDING OFCR. SCOTT: Dr. Ward, is
2 this in testimony someplace, on Mr. O'Neal's
3 testimony?

4 DR. WARD: Yes. They've been talking
5 about that it's nothing. This has been said I
6 don't know how many different times, that it's
7 not a thing to worry about. And, I'm just
8 trying to find out where the data are that --
9 on which they made such statements. I can go
10 back into the record and start to find those.
11 But many of the Antrim Wind people have tossed
12 off icing as such a minor problem. I don't
13 know whether it's minor or not.

14 PRESIDING OFCR. SCOTT: But my
15 question to you is, this is Mr. O'Neal, and he
16 has -- his testimony covers certain areas. And
17 I'm not recollecting that ice buildup on the
18 turbines is one of his areas that he talked
19 about.

20 DR. WARD: I thought we had a deal,
21 that I could get a shot at somebody, if I
22 didn't quite know who to ask. And, I don't
23 know whether he's the man to ask, but he sure
24 looks like it.

{SEC 2015-02} [Day 4/Morning Session ONLY] {09-22-16}

[WITNESS: O'Neal]

1 PRESIDING OFCR. SCOTT: All right.

2 Why don't you ask him if he's the one to ask.

3 BY DR. WARD:

4 Q. You're not the one to ask about this?

5 A. I am not the one to ask.

6 DR. WARD: Okay. That's fine. As
7 long as we got a deal I could give a shot at
8 it.

9 BY DR. WARD:

10 Q. Okay. You've had physics, I assume, in high
11 school and college and so forth?

12 A. (Witness nodding in the affirmative).

13 Q. And we know, from earlier testimony, that the
14 blades on the Antrim -- proposed Antrim thing
15 can make a full revolution in I think it was
16 six seconds -- no, it was six -- it was 14
17 revolutions per second [minute?], it's
18 something like three or four seconds for a
19 complete revolution of the blades. Are you in
20 about the right ballpark?

21 A. It's about a 15 RPM machine.

22 Q. All right. That's one every four seconds?

23 A. Right.

24 Q. Okay. That's the number then. Have you calc

[WITNESS: O'Neal]

1 -- let me -- I may be able to solve this
2 quickly. Have you been asked to calculate
3 using the -- to calculate the speed of the
4 blade tip, when they're rotating at 15
5 revolutions per minute, the speed of the tip of
6 the blade at its peak?

7 A. So, yes, I have.

8 Q. And what is that number?

9 A. So, if you're -- and I believe it's actually
10 15.5 to be precise, RPMs. I'm going to give
11 you a round number.

12 Q. I'm rounding.

13 A. Fine. So, at about 15 and a half RPM, which is
14 the fastest they can spin, diameter of the
15 blade is 113 meters, that puts the tip speed at
16 about 205 miles per hour.

17 Q. Okay. Now, if a piece of ice broke off the
18 blade going at that speed, how far would it be
19 thrown before it hit the ground?

20 A. I don't know. I can't answer that. I didn't
21 do that analysis.

22 Q. You know there are data, and I'll give you the
23 book, on the fall rate of things. And, so, the
24 number is known as to how fast it will reach

[WITNESS: O'Neal]

1 the ground, and will know, from your number,
2 how fast it was going.

3 PRESIDING OFCR. SCOTT: Dr. Ward,
4 remember we had that deal? So, why don't you
5 ask him if this is part of his testimony, and I
6 think you'll get an answer that will stop this.

7 DR. WARD: Okay.

8 BY DR. WARD:

9 Q. Let me ask, you have not calculated how far a
10 piece of ice could be thrown off the blades at
11 the top?

12 A. That is correct.

13 Q. Thank you. Okay. I want to finish up by going
14 back to the question that I screwed up and
15 couldn't find the other day. I finally found
16 what I had written. So, I'm going back to
17 that.

18 Just quickly, roughly what velocity of
19 winds generate the most noise? You can put all
20 that aside, I'll get it later.

21 A. So, I'm going to look up, in the sound level
22 report we have that information provided. So,
23 in Chapter 7, Table 7-1, is a table that shows
24 you various wind speeds and various sound

[WITNESS: O'Neal]

1 levels.

2 Q. Right. I see it.

3 A. And that's where that information is. So, the
4 highest sound levels are reached when you have
5 a wind speed of approximately 10 meters per
6 second at hub height.

7 Q. Does wind shear affect the noise level?

8 A. The sound level generated by the turbines is --
9 no, it's not. It's independent of wind shear.
10 In other words, they put out a sound power
11 level independent of wind shear.

12 Q. So, even if the winds were varying, and it was
13 moving the thing around, that's not going to
14 make more or less noise?

15 A. No.

16 Q. And, if the winds were speeding up or dying
17 down, so that the turbine were to be speeding
18 up or dying down, that does not affect the
19 noise level?

20 A. Well, it's going to affect the noise level as
21 this table indicates. You have to look at the
22 table.

23 Q. No, no. Other than just as a part of the speed
24 factor. Going back to the original thing,

[WITNESS: O'Neal]

1 which -- what is the environment, the
2 topography and the meteorology, of the area in
3 which the turbines are tested and for which a
4 number is given for the expected sound level at
5 the turbine under operating conditions?

6 A. So, there's a very strict procedure. It's laid
7 out by the International Electrotechnical
8 Commission, the IEC, in terms of testing
9 turbines for a lot of parameters, including
10 sound. And that's generally tested on flat
11 ground, at a referenced distance that's in
12 proportion to the height of the turbine.

13 Q. Would you expect that, if that were sitting on
14 top of an isolated hill, that those tests would
15 be any different?

16 A. No.

17 Q. Have they ever tried that? To your knowledge?

18 A. I am not familiar with the IEC, whether they
19 have tried it on different hills, no.

20 Q. So, from your knowledge, you don't know whether
21 the numbers that Antrim Wind is quoting for the
22 starting noise level are, in fact, the right
23 numbers for the starting noise level of their
24 expected turbines, sitting on an isolated ridge

[WITNESS: O'Neal]

1 at 2,000 feet above sea level?

2 A. No, they are the correct numbers. Yes.

3 Q. No, I asked the question, do you know that they
4 are or do you -- do you know they are?

5 A. Well, I guess there's two ways to answer that.
6 I've done enough of these that, yes, I know
7 that that is true. Number two, Siemens is
8 going to guarantee these numbers.

9 Q. Repeat it.

10 A. Siemens is going to guarantee the sound power
11 level of these numbers to Antrim Wind.

12 Q. Is that "guarantee" -- I don't know what that
13 means. In other words, they will shut them
14 down if they exceed it or whatever? What does
15 the "guarantee" mean?

16 A. The "guarantee" means that Siemens has the
17 utmost confidence that the sound levels are
18 right. Because, if, for some reason, they were
19 not right, they would have to make them right
20 at their expense.

21 Q. Let me just quickly hit upon a couple of things
22 in 9613-2. And I have to say, I don't
23 understand what's in it. It was badly written.
24 If you do, I should have asked you before I

[WITNESS: O'Neal]

1 started, because you could have explained to me
2 what it really meant. But let me just ask a
3 couple of quick questions about it.

4 Your model replicates the procedures as
5 outlined in 9613-2, correct?

6 A. We use a commercial software package called a
7 "Cadna model", which is very widely used in the
8 industry. That Cadna model incorporates the
9 standard exactly, yes, in the software.

10 Q. Let me try the question again. Does it do
11 exactly what 9613-2 says to do?

12 A. Yes.

13 Q. Do you have ISO 9613-2 in front of you?

14 A. I do not.

15 Q. I'm going to refer to Clause 6, which is
16 labeled "Basic Equations". Now, that basic
17 equation is pretty simple. It just says you
18 start with a number, and then you attenuate the
19 sound as it goes up, due to various and sundry
20 things. Is that your understanding of it?

21 A. We talked about this on Tuesday, yes.

22 Q. So, I'm looking at the -- give me a second. If
23 you look at Factor A, which is made up of five
24 A factors, these are all A, for "attenuation",

[WITNESS: O'Neal]

1 how much the sound decreases through the
2 whatever. At one point in it it says that
3 there's an assumption that the sound
4 attenuation, the loss of sound, follows a
5 spherical shape. Now, a spherical shape to me
6 means that the sound goes up, down, and
7 sideways. Is that your same understanding?
8 360 degrees in all directions?

9 A. Yes.

10 Q. Okay. That has never modified in any of the
11 calculations that I can see here. Did I miss
12 anything?

13 A. That is taken into account in the model.

14 Q. What is taken into account?

15 A. The divergence, that's what you're talking
16 about. That is taken account in the model from
17 a radiating object.

18 Q. In other words, in this -- what's the name of
19 the model?

20 A. In the Cadna model.

21 Q. The Cadna model, even though this says it
22 assumes spherical, the model does something
23 else?

24 A. The model handles it properly, yes.

[WITNESS: O'Neal]

1 Q. I didn't ask that question. It does something
2 else other than spherical?

3 A. I guess, if we want to really dive deep in the
4 model, I want a copy of the standard in front
5 of me please.

6 Q. The reason I'm asking this, Mr. O'Neal, is that
7 there are a lot of things said in the model,
8 and I don't quite know what they apply to. So,
9 I thought, if I started off and just said to
10 you "did you follow the ISO thing?", that then
11 we could work from the ISO. But what you're
12 saying is, and correct me if I'm wrong, is that
13 your model doesn't quite follow ISO 9613-2?

14 A. I never said that.

15 Q. Well, let me try it again. Does your model
16 follow ISO 9613-2 precisely?

17 A. Yes, it does.

18 Q. Thank you. It says, however, in this that the
19 attenuation factors, the A factors, which are
20 on Page --

21 PRESIDING OFCR. SCOTT: Dr. Ward, I
22 think what he said is he wants a copy of that,
23 if you're going to reference it.

24 DR. WARD: Well, I can only give him

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1 my copy, then we could work on it. I was
2 hoping somebody would have one.

3 PRESIDING OFCR. SCOTT: Why don't we
4 go off the record.

5 *[Brief off-the-record discussion*
6 *ensued.]*

7 PRESIDING OFCR. SCOTT: Okay. Back
8 on the record. You're all set, Dr. Ward.

9 DR. WARD: I have to get my glasses
10 now. The print is pretty small.

11 BY DR. WARD:

12 Q. I assume your model used zero on the
13 directional source, like a turbine, and then
14 you subtracted the attenuation factors, A, is
15 that correct, that is following this?

16 A. That's right.

17 Q. Okay. So, I'm going to focus on the -- and
18 there were five factors in A, most of which
19 don't require much of anything. Factor A-DIV,
20 for "divergence", can you give me just a short,
21 quick summary of that, and particularly how
22 it's related to the spherical assumption
23 earlier in it?

24 A. Yes. The factor "geometrical divergence" is

[WITNESS: O'Neal]

1 just simply the reduction of sound as the sound
2 waves move away from the source.

3 Q. That's the spherical assumption.

4 A. That's the geometrical divergence. That's Item
5 7.1 here.

6 Q. Is it up, down, and sideways?

7 A. It spreads in every direction.

8 Q. Up, down, and sideways?

9 A. I'm not sure what you mean by "up, down, and
10 sideways". But it goes from a source, such as
11 a turbine, towards a residence. So, a direct
12 line, a direct path.

13 Q. It diverges in all directions?

14 A. Yes.

15 Q. Okay. And, if there were an inversion, as is
16 mentioned a number of places through this, I
17 never know where it really applies, but, if
18 there's an inversion, then it doesn't go up.
19 Isn't that true?

20 MR. NEEDLEMAN: Mr. Chair, I think
21 we've covered all this.

22 PRESIDING OFCR. SCOTT: Mr. Ward, do
23 you remember Tuesday we -- I do remember we
24 talked about inversions and channeling, or

[WITNESS: O'Neal]

1 "ducting", I think you called it. Is this a
2 different line of questioning?

3 DR. WARD: Yes, it is.

4 PRESIDING OFCR. SCOTT: Okay.

5 BY DR. WARD:

6 Q. So, the first term in the attenuation that has
7 to do with spherical spreading is either not --
8 is in or is not in the model?

9 A. Well, it's in --

10 Q. Your model?

11 A. Oh, of course it is.

12 Q. And how do you handle non-spherical spreading?
13 Because I don't see anywhere in here to do it.
14 And, so, I'm curious as to how you could get
15 it.

16 A. If we had that type of situation, there are
17 some other directivity correction factors that
18 you could input to the model. That has nothing
19 to do with what we're talking about here,
20 today.

21 Q. I thought we were -- you said your model
22 replicates the instructions in this ISO 9613-2?

23 A. Maybe I could make it a lot simpler.

24 Q. Fine. I'd like that.

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[WITNESS: O'Neal]

1 A. We followed the steps -- these different
2 equations are embedded in the software. We
3 don't touch these equations. They are
4 hardwire. We followed the steps, we followed
5 the procedures of ISO 9613-2. And we know,
6 from testing turbines after they're built, that
7 the way we run the model is accurate, using
8 this propagation standard.

9 Q. In Clause 7.1, which is I think the next page,
10 it talks about this thing, and sort of moves
11 on, but it never says how they define a phrase
12 called a "well" -- I'll quote it,
13 "well-developed, moderate, ground-based
14 temperature inversion". Did you ever get --
15 I'm sorry. What is your definition in the
16 model of a "well-developed, moderate,
17 ground-based temperature inversion"?

18 A. There is -- there is nothing about the model
19 where you change an input to reflect a
20 different type of inversion. As we talked
21 about again on Tuesday, this standard for
22 attenuation of sound outdoors is applicable
23 under inversion conditions.

24 Q. Under what conditions?

[WITNESS: O'Neal]

1 A. Under inversion conditions.

2 Q. Well, there are inversions and inversions and
3 inversions every night, most of the time, in
4 most places. So, --

5 A. There is no switch in the model to tell it to
6 go from a light inversion, to a moderate
7 inversion, to a heavy inversion, or whatever
8 you want to call it. It's a temperature
9 inversion.

10 Q. Is what you're saying is you put in the
11 temperature structure, and hence the inversion
12 is defined thereby?

13 A. No. The temperature is an input for the
14 atmospheric absorption, which is 7.2. Another
15 one of the A terms here in the model.

16 Q. Right.

17 A. Then, we put in a temperature and a relative
18 humidity, which affects the type of atmospheric
19 absorption through the air.

20 Q. But how do you put in your definition or your
21 measurement or whatever it is of the
22 temperature inversion?

23 A. Well, I told you, that's not an input to the
24 model.

[WITNESS: O'Neal]

1 Q. Oh. Okay. In other words, you don't put in --
2 you don't account for the inversion or its
3 strength, is that what you're saying?

4 A. It's not an explicit input to the model.

5 Q. That wasn't the question I asked. Do you
6 account for the strength of the inversion? And
7 does a stronger inversion give you different
8 results from a moderate one?

9 MR. NEEDLEMAN: Mr. Chair, I really
10 don't see how this is a different line of
11 questioning. I feel like we've covered all of
12 this.

13 PRESIDING OFCR. SCOTT: Maybe we
14 could expedite this. I actually agree with
15 Attorney Needleman, we did cover this Tuesday.
16 I remember --

17 DR. WARD: No, we did not cover this
18 part of it, I'm sorry. But --

19 PRESIDING OFCR. SCOTT: Maybe you
20 could try --

21 DR. WARD: Let me ask -- Mr.
22 Chairman, let me just ask one quick question.

23 BY DR. WARD:

24 Q. When you run the model, do you have a number, a

[WITNESS: O'Neal]

1 term, or something in it that will take into
2 account the strength of the inversion?

3 A. No.

4 DR. WARD: Thank you. I think
5 that's -- give me a second here, but I think
6 we're pretty well finished. Sorry, I had one
7 other thing.

8 BY DR. WARD:

9 Q. There's a term in there for the G factor that
10 we talked about. You always use 0.5, if I
11 remember correctly, isn't that what you said?

12 A. That's what we use, yes.

13 Q. Okay. In seven months of the year, in Antrim,
14 there's no foliage on all the deciduous trees.
15 Would you agree with that?

16 A. Sounds about right.

17 Q. Okay. During those seven months, there would
18 be many days, and I can show you some weather
19 data, I didn't get the exact number, but
20 certainly many days, on the order of maybe 50
21 or 100 days, on which there's a complete snow
22 cover on the ground. It can be deep. And I
23 can show you some data which shows that it was
24 rained on and it was frozen, and so it would

[WITNESS: O'Neal]

1 produce an ice surface.

2 MR. RICHARDSON: Mr. Chairman?

3 BY DR. WARD:

4 Q. You make no change in --

5 PRESIDING OFCR. SCOTT: Hold on, Dr.
6 Ward.

7 MR. RICHARDSON: I don't mean to
8 interrupt, if we're doing something different.
9 But I think we went over this on Tuesday. We
10 had the whole G factor discussion, and somebody
11 talked about Lake Winnepesaukee. I just want
12 to make sure we're not going over the same area
13 twice.

14 DR. WARD: I really have one
15 question.

16 PRESIDING OFCR. SCOTT: Why don't you
17 let him finish the question, before you object
18 to it.

19 DR. WARD: Okay.

20 BY DR. WARD:

21 Q. Do you ever, in situations where you know
22 there's going to be an ice-covered snow cover,
23 and there's essentially no leaves on the trees.
24 And you would know that, if the sound went out,

[WITNESS: O'Neal]

1 you'd hit more snow and ice, rather than wood.

2 Do you make any adjustment to that factor?

3 A. No. We use the conservative 0.5.

4 DR. WARD: Fine. I think that -- let
5 me -- give me just a second, and I think we're
6 done.

7 (Short pause.)

8 DR. WARD: No. I think I'm done.
9 Thank you very much, for your patience, Mr.
10 Chairman.

11 PRESIDING OFCR. SCOTT: Thank you.

12 DR. WARD: And to the others in the
13 room, for your patience, too.

14 PRESIDING OFCR. SCOTT: Off the
15 record real quick.

16 *[Brief off-the-record discussion*
17 *ensued.]*

18 *[Documents distributing by*
19 *multiple parties for Ms.*
20 *Linowes.]*

21 (The documents, as provided,
22 were herewith marked as Exhibits
23 **WA-25x** through **WA-28x**,
24 respectively, for

[WITNESS: O'Neal]

1 identification.)

2 PRESIDING OFCR. SCOTT: Okay. Back
3 on the record. Ms. Linowes.

4 MS. LINOWES: Thank you. Good
5 morning, Mr. O'Neal.

6 WITNESS O'NEAL: Good morning.

7 BY MS. LINOWES:

8 Q. I wanted to start by asking you, on Tuesday,
9 you had stated that, according to your model,
10 you had predicted a maximum noise level at any
11 property that would be experienced from the
12 wind turbine operating project would be
13 "38 decibels", is that correct?

14 A. That's correct.

15 Q. Okay. And, at the -- okay. What I'd like to
16 do, just to state up front, I'm going to step
17 through several documents today, and I believe
18 it's going to actually show that that -- your
19 model may actually be under predicting the
20 noise. So, let's get started with that.

21 First thing, on New Hampshire Site Rule
22 301.18(c)(3), you may not know the rule, but
23 this requires that a "predictive sound modeling
24 study shall: Include predictions to be made at

[WITNESS: O'Neal]

1 all properties within two miles from the
2 project wind turbines for the wind speed and
3 operating mode that would result in the worst
4 case wind turbine sound emissions during the
5 hours before 8:00 a.m. and after 8:00 p.m. each
6 day." Do you recognize that wording or
7 recognize the requirement?

8 A. I do, yes.

9 Q. Okay. And that is what you did?

10 A. Yes.

11 Q. Okay. So, is it appropriate to say that, since
12 a wind project is not constructed yet, the
13 purpose of a predictive model is to identify
14 the noise limits that are going to come --
15 noise that will be emitted from a project to
16 make sure that it will fall within the standard
17 established by, in this case, New Hampshire's
18 rules?

19 A. That's correct.

20 Q. Okay. And you're obviously aware that the
21 standard is a 40 decibel not-to-exceed figure,
22 correct?

23 A. Forty (40) at night, 45 during the day, yes.

24 Q. Yes. Okay. Great. Thank you. Now, there's

[WITNESS: O'Neal]

1 been a lot of discussion about the model. And
2 I am not going to try to dissect the model. I
3 will take the model on face value. But I do
4 want to talk to you about a couple of the
5 parameters, and -- because that's what I want
6 to focus on today in my cross-examination of
7 you.

8 The first thing that we heard about was a
9 "G factor", which is ground absorption. And I
10 believe that, and you could either explain, or
11 I'll just give you briefly what it is, you tell
12 me if I'm correctly characterizing what the G
13 factor is, okay? And I believe that is
14 described as a metric for how much we could
15 expect noise to be adsorbed by the ground or
16 the surface of the Earth, even though it might
17 be a forested area, but there's some value that
18 gauges how much of the sound coming out of the
19 turbines will be absorbed by the Earth, is that
20 correct?

21 A. It's more or less correct. It might be
22 helpful, for the record, if I read the first
23 sentence right out of the standard, which
24 defines the ground effect portion.

[WITNESS: O'Neal]

1 Q. Okay.

2 A. It says "Ground attenuation is mainly the
3 result of sound reflected by the ground surface
4 interfering with the sound propagating directly
5 from the source to the receiver." So,
6 certainly, the ground element is part of that,
7 yes.

8 Q. Okay. And there is a -- that is a number that
9 is between zero and one, is that correct?

10 A. That is the G factor that goes into it, yes.

11 Q. Okay. And you used a G factor of 0.5, I think
12 that has been established, correct?

13 A. Yes.

14 Q. And that means "mixed ground"?

15 A. Correct.

16 Q. And what does that mean? What is "mixed
17 ground"?

18 A. So, "mixed ground" would say it's being -- some
19 of it's hard and some of it's porous or soft.

20 Q. Okay. Thanks. And, now, if I could direct
21 your attention to WA-26x, that is one of the
22 documents that I handed out.

23 MS. LINOWES: And, Mr. Chairman, this
24 is also included as a document I had submitted

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1 as part of the prehearing conference, but I
2 just thought it would be easier to have it in
3 paper form.

4 PRESIDING OFCR. SCOTT: Okay.

5 BY MS. LINOWES:

6 Q. And if you can go to Question Number 1-9. I'll
7 just get my copy here. Seems like I gave my
8 copy away.

9 Okay. Now, here, this is a question I had
10 asked you as a data request. And I asked you
11 what would be the difference in the output of
12 your predictive model if you had used a ground
13 absorption value or G factor of zero versus
14 0.5? And you said it would be "about 3
15 decibels", is that correct?

16 A. That's correct.

17 Q. Okay. And, so, now, if I understand that
18 correctly, if you had -- putting it in the
19 context of your predictive model, if you had --
20 you're saying now that the maximum number
21 coming -- rather, maximum sound level that
22 will be measured at any property will be
23 38 decibels. If you had used a G equals
24 zero, in fact, the maximum output would be 41,

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1 if I understand you correctly. Is that
2 right?

3 A. That's correct.

4 Q. Okay. And that would actually put the Project
5 out of compliance, would it not?

6 A. Well, but that's an incorrect assumption.

7 Q. No, I'm just asking you. If, in fact, you used
8 a G of zero, and it ended up -- okay, you had
9 told me, actually, at the technical session,
10 you had run the model. But I'll say, for the
11 sake of this, you haven't run the model. But,
12 if you had run the model with a G equals zero,
13 we might see a maximum amount for it of 41, is
14 that correct?

15 A. It would be about 3 decibels higher. About 41,
16 yes.

17 Q. Okay. All right. Thank you. Now, the next
18 parameter -- so, we've got that under control.
19 The next parameter is the uncertainty factor,
20 the turbine uncertainty factor, okay? Now, you
21 have testified, I believe it's in your report,
22 you've said it, you've talked about it today as
23 well, that uncertainty factor is a number that
24 comes out of a test that the manufacturer

[WITNESS: O'Neal]

1 performs on the turbine, is that correct?

2 A. That's correct.

3 Q. And, in that number, in this case, for this
4 turbine, is 1.5 decibels, is that correct?

5 A. Correct.

6 Q. Okay. So, the turbine itself has an expected
7 noise level coming out of it. There is a test
8 performed. And, then, there's an uncertainty
9 factor that's applied. Am I -- maybe I'm
10 garbling that, maybe you could state that more
11 clearly what's happening there.

12 A. I mean, it's a pretty involved test. But,
13 essentially, yes. The manufacturer will
14 conduct a series of sound level tests on a
15 particular model of a wind turbine. So, the
16 Siemens 3.2-113, the one we're talking about
17 here, they will do a number of tests on them.
18 They'll come up with an apparent sound power
19 level.

20 Q. Uh-huh.

21 A. That's the 106 decibels that's in the report.
22 Then, there's also an uncertainty associated
23 with that, because it's not always exactly 106,
24 it might be a little higher, might be a little

[WITNESS: O'Neal]

1 lower. So, they come up with the K factor, an
2 uncertainty, which is the turbine
3 manufacturer's uncertainty. And every
4 manufacturer does this. It's part of the
5 standard. And it usually ranges between one
6 and two decibels. In this particular case,
7 it's 1.5 decibels.

8 Q. Okay. Great. So, we have a G factor and we
9 have a K factor?

10 A. (Witness nodding in the affirmative).

11 Q. Okay. And -- okay. That's good. Now, and you
12 said that that test is done on flat ground, is
13 that correct?

14 A. That test is done according to the IEC
15 standard.

16 Q. Which is, --

17 A. Which is generally --

18 Q. -- you said earlier --

19 A. It's flat ground, yes.

20 Q. Okay. Thank you. Now, then the third factor I
21 want to talk about, and then we could really
22 delve into this, the third factor is the ISO
23 9613-2's own limitations. Now, the 9613-2
24 standard is this -- is the model you used for

[WITNESS: O'Neal]

1 your predictive model, is that correct?

2 A. Correct.

3 Q. And that comes in a commercial package called
4 "Cadna/A"?

5 A. Correct.

6 Q. Okay. And, now, the standard, the ISO standard
7 has a plus or minus 3-decibel estimated
8 accuracy. Now, I know that you have an
9 objection to how this is applied. But can you
10 explain what that means?

11 A. Sure. I mean, we did talk about this on
12 Tuesday with Dr. Ward quite extensively.

13 Q. Okay. You know, I'll just summarize then, if
14 you want?

15 A. I mean, --

16 Q. Go ahead.

17 A. -- I could answer it, certainly.

18 Q. Okay.

19 A. So, it's Clause 9 in the standard, it's called
20 the "accuracy limitations of the method". And
21 it's stated very clearly in there that -- what
22 conditions that applies to that accuracy
23 limitation.

24 Q. Okay.

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1 A. And it can range from plus or minus one to plus
2 or minus three decibels, depending on the
3 height of the source, the height of -- I'm
4 sorry, the distance from the source to the
5 receiver, plus or minus three. But there are
6 parameters in there, as I talked about on
7 Tuesday, for the height limit and the distance
8 limit.

9 Q. Yes.

10 A. And this Project falls outside of those. And,
11 so, it would really be improper and going
12 against the standard to take a plus or minus
13 three.

14 Q. And I understand, I understand that that's your
15 position. And I want to explore that with you
16 a little bit. So, what you're saying is that,
17 under the standard as it stands, a noise source
18 cannot -- has to be less than 30 meters from
19 the surface, and the receptor, that is the
20 entity that is receiving the noise, has to be
21 less -- between a 100 and a 1,000 meters or
22 kilometer. And, if that -- if you're
23 predicting a noise under those conditions,
24 there's a plus or minus three tolerance,

[WITNESS: O'Neal]

1 decibels tolerance, is that accurate?

2 A. Yes. It's not a correction factor.

3 Q. No, I understand.

4 A. Okay. It's different than a correction factor.

5 As it states in there, it's an accuracy of the
6 method.

7 Q. So, now I'm going to go out on a limb here and
8 ask you, when we -- here we're in this election
9 season, we have all these polls, and they call
10 them -- talk about "margins of error". I'm
11 going out on a limb to say this might be akin
12 to a "margin of error"?

13 A. I'm not familiar with how they do the polls,
14 and how they calculate those plus or minus
15 percentages.

16 Q. Uh-huh.

17 A. It could be.

18 Q. But conceptually?

19 A. Possibly.

20 Q. Okay. Okay. Now, so -- now, as you said, you
21 have said that the turbine height exceeds the
22 30-meter and -- 30-meter height, and that's
23 actually 261 feet up in the air. So, the noise
24 source is either 261 feet or 303 feet above the

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1 surface of the ground. So, it falls outside
2 the limits of the ISO standard, is that
3 correct?

4 A. That's correct.

5 Q. Okay. Now, I want to understand your
6 statement, though. Are you saying that running
7 the predictive model there is -- that as you
8 are, under these conditions, a very tall noise
9 source and your in distances out to 2 miles
10 away, there is no estimated accuracy associated
11 with the model? Or, there is one, but you
12 don't know what it is? It's not stated by the
13 standard?

14 A. So, I guess, two parts to that, to my answer.
15 One is, it's clearly not part of Clause 9,
16 which is part of the standard.

17 Q. Uh-huh.

18 A. That doesn't -- doesn't strictly apply.

19 Q. Uh-huh.

20 A. Number two, I would again go back to what I
21 told Dr. Ward on Tuesday, in that there are
22 several publications, testing that's been done
23 on sources, that shows that, with the proper
24 inputs to the model, which we used, the plus or

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1 minus three is -- if you applied that, you
2 would be significantly overstating the model
3 numbers.

4 Q. Okay. Thank you. So, you're saying there's an
5 empirical aspect to this? That, in the field,
6 when you test it, tested the turbines, you're
7 seeing an accuracy, so that there's not a need
8 to add that plus or minus three, is that
9 correct?

10 A. Right. The reality, the real-world testing
11 that we've done in Groton, New Hampshire, and
12 other places, has shown that, that to be --
13 this methodology to be quite accurate.

14 Q. Okay. But, to a modeler, in effect, what you
15 are saying, and if you take out that empirical
16 aspect of it, to a modeler, are you, in a
17 sense, saying "you have a model that's
18 perfect"?

19 A. Well, nothing is perfect, no. That's why you
20 add some uncertainty, you add the
21 manufacturer's uncertainty. We add a mixed
22 ground factor in there. And experience has
23 shown that those, by doing it that way, you
24 come pretty close to -- yes, you're still

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1 overstated slightly, but you're pretty close to
2 reality.

3 Q. Okay. All right. Then, let's go and explore
4 some of those documents, because I think that's
5 important.

6 So, just to summarize, because we're going
7 to now go into the detail, three factors, the G
8 factor of 0.5, the K factor of 1.5, and then a
9 debate over whether or not the 3 decibels has
10 to be added in as well, correct?

11 A. I mean, there's a lot more to the model than
12 just that. Of course, there's other factors --

13 Q. I understand. I'm talking about the inputs
14 into the model, and not the model -- the
15 operation of the model.

16 A. I mean, there still are other inputs. We have
17 to input the distances from the turbines to all
18 the residences, and things like that, the sound
19 power level of the turbines. So, there are
20 some other inputs. I don't want to mislead
21 people. But these three you just listed are
22 not the only inputs.

23 Q. Okay.

24 A. There some professional judgment that comes

[WITNESS: O'Neal]

1 with some of those. But, yes.

2 Q. And, let me just ask you a question regarding
3 the K factor, to go back just a second. It's
4 use in the model is by virtue of you adding it.
5 So, the manufacturer tells you the 106
6 decibels. Then, you add in the 1.5. And
7 that's how it shows up in the model, correct?
8 There's nothing else that you do with that 1.5.
9 You don't tack it on to your predictive
10 results, correct?

11 A. Right. That 1.5 is simply added to the sound
12 power of the turbines. So, we're really
13 modeling it at 107.5.

14 Q. Okay.

15 A. It's just additive.

16 Q. Okay. Thank you. That's very helpful. Now,
17 you agree that meteorological conditions on a
18 ridgeline can be quite variable?

19 A. Sure.

20 Q. And you've testified that those don't matter?
21 That the sound power output of the turbine is
22 107.5, and those meteorological conditions are
23 not going to alter that output. I believe you
24 said that earlier today, unless I misunderstood

[WITNESS: O'Neal]

1 you?

2 A. Right. That's the sound power of the
3 instrument.

4 Q. And the decibels coming out of that unit that
5 are measured out say 2,000 feet, 4,000 feet,
6 those will -- those will be consistent, whether
7 there's a lot of wind and wind shear on the
8 mountain or not, is that what you're saying?

9 A. More or less. But, again, as I said to
10 Dr. Ward, remember, different wind speeds
11 generate different sound levels from the
12 turbines. Depending on the wind speed, you can
13 have different sound levels as is, --

14 Q. Right.

15 A. -- you know, discussed in the report.

16 Q. I understand. I'm talking about when it's
17 maximum output, which I believe is what you
18 modeled, correct?

19 A. That's correct.

20 Q. Okay. So, in those conditions, maximum output
21 107.5 decibels, not going to go above that?

22 A. That's correct.

23 Q. Okay. Thank you. Now, I want to call your
24 attention to, if you can, my Exhibit WA-13. I

[WITNESS: O'Neal]

1 don't know if you have that in front of you,
2 Mr. O'Neal. These are exhibits that I
3 submitted as part of the prefiled testimony --
4 prehearing conference.

5 A. Did you say "WA-13"?

6 Q. WA-13. You may not have that.

7 A. I do not have that one.

8 MS. LINOWES: Okay. Mr. Needleman,
9 could you see to it that he has that?

10 PRESIDING OFCR. SCOTT: Why don't we
11 go off the record while we get the witness a
12 copy.

13 *[Off the record and a brief*
14 *off-the-record discussion*
15 *ensued.]*

16 PRESIDING OFCR. SCOTT: Back on the
17 record.

18 BY MS. LINOWES:

19 Q. This is WA-13, which is a -- this is -- the
20 title of the document is "Environmental Sound
21 Survey and Noise Impact Assessment". This was
22 a similar study as to what you conducted at
23 Antrim Wind, only this was at the Buckeye Wind
24 Project proposed in Ohio. Do you have that in

[WITNESS: O'Neal]

1 front of you?

2 A. I see the document in front of me, dated March
3 12, 2009?

4 Q. That's correct.

5 A. Okay.

6 Q. And this was prepared by David Hessler. Do you
7 know Mr. Hessler?

8 A. I know of him. I don't know him personally.

9 Q. Okay. So, you know that he does
10 conduct similar -- he's an acoustician. He
11 conducts similar studies to what you did in
12 Antrim Wind, would you agree with that?

13 A. He's an acoustical guy who does conduct sound
14 studies. That's right.

15 Q. At wind projects?

16 A. Yes.

17 Q. Okay. Thank you. Now, so, if you look on Page
18 26, you see in the first paragraph there, under
19 "Noise Modeling Methodology", he states that he
20 is also using the ISO 9613-2 model for
21 predictive modeling?

22 A. Yes, I see that.

23 Q. And it's also the Cadna/A product that he's
24 using?

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[WITNESS: O'Neal]

1 A. Yes. I see that.

2 Q. Okay. And he is treating the turbines as, this
3 is going down to the fourth paragraph there,
4 he's using an absorption factor -- or, G factor
5 of 0.5, as you did, correct?

6 A. Yes, I see that.

7 Q. Okay.

8 A. Yes.

9 Q. Okay. Now, -- okay. Now, I want to direct
10 your attention to Page 33 of his report. And
11 there are two paragraphs that are numbered "1"
12 and "2". I would like to read you part of
13 Paragraph 1 and get your sense of what he's
14 saying there, and how it applies to what you're
15 saying.

16 He says "Predictions made using the ISO
17 9613-2, the worldwide standard for noise
18 propagation calculations, characterize sound
19 levels under average or normal conditions.
20 There will be times when atmospheric
21 conditions, temperature gradients and wind
22 shear gradients cause sound levels at any given
23 location to vary above and below the nominal
24 prediction value largely because wind turbine

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[WITNESS: O'Neal]

1 sound originates at a high elevation above the
2 ground making it more susceptible to
3 atmospheric influences." And, then, the last
4 sentence: "This means that somewhat higher
5 sound levels from the Project may well occur
6 from time to time."

7 Now, that -- do you disagree with what Mr.
8 Hessler is saying?

9 A. I think it's important to understand what he
10 said earlier on, on the page we were looking at
11 before. He suggested, on the ground factor,
12 that he could use a factor of 0.8 or 0.9. He
13 said, to be conservative, he was going to use a
14 0.5 in the study. I think that's one of the
15 reasons he did, was to put a little bit of
16 design margin, as he says in here.

17 Q. But he's talking about the results of the
18 model, and it's not -- that portion, he's
19 speaking specifically about 9613 here, not the
20 0.5, or the point whatever number he might have
21 used. He is saying that the ISO is used "under
22 average or normal conditions. There are times
23 when atmospheric conditions, temperature
24 gradients and wind sheer gradients cause sound

[WITNESS: O'Neal]

1 levels...to vary above and below the nominal
2 predicted value." Do you agree or disagree
3 with that statement?

4 A. I guess my answer to that would be, and I see
5 where you're reading from. Yes, he said that.
6 You know, this is back in 2009. Our experience
7 is that, in actually measuring them under wind
8 shear conditions, and measuring ridge top
9 projects, and also others that we've put in
10 exhibits here, that, if you use a 0.5, for
11 example, he suggested here that he could use a
12 0.8, but he used a 0.5.

13 Q. Correct. But he did use a 0.5.

14 A. He did, to give himself some design margin.
15 Because there is a little bit of variation to
16 it. So, --

17 Q. I understand. We established that there is a
18 variation when you change the G factor.

19 A. Right.

20 Q. We did establish that?

21 A. Right.

22 Q. Okay. So, let's move on. I would like to now
23 look at WA-14. Can you get quick access to
24 that? Oh, I'm sorry, not -- oh, wait. Let me

[WITNESS: O'Neal]

1 make sure. Yes, WA-14. WA-14.

2 PRESIDING OFCR. SCOTT: And, while
3 he's looking, can you tell us what page you're
4 going to?

5 MS. LINOWES: Yes, I can. Page 11.

6 BY MS. LINOWES:

7 Q. Do you see that? I'm on Page 11, Mr. O'Neal.

8 A. Okay. I just -- I have it open. Just give me
9 a second to get to Page 11.

10 Q. Okay.

11 A. Let me enlarge it, so I can read it. Okay, I'm
12 there.

13 Q. Now, this report is also a noise assessment
14 done at a project -- a proposed project called
15 "Hermanville Wind Farm". And it was prepared
16 for -- this was a project that was proposed for
17 Prince Edward Island, in Canada. And, if you
18 could turn to Page 11, if you're there?

19 A. I'm there, yes.

20 Q. Now, you see he has bulleted items under the
21 conditions under which he ran the model. And
22 he says that he applied the turbine uncertainty
23 factor there, do you see that in the first
24 bulleted item?

[WITNESS: O'Neal]

1 A. "Turbine sound power Level of 107.04 compared
2 to the measured of 106.5." So, he applied an
3 uncertainty of 0.9, is that what --

4 Q. Yes. So, that's the K factor?

5 A. Yes.

6 Q. Okay. And, then, he also used -- he uses a
7 different ground absorption, he uses 0.7,
8 instead of 0.5. You see that in the next item?

9 A. Yes. I see that.

10 Q. Okay.

11 A. Yes.

12 Q. And, then, the paragraph -- the last paragraph
13 on that page, it starts "Given the
14 conservativeness of noise model inputs and
15 parameters, the predicted noise levels at the
16 receptors should be somewhat worse...compared
17 to the long-term average noise levels that are
18 actually encountered." So, "somewhat worse".
19 And do you disagree or agree that he's using
20 that -- it's not necessarily "worst case", it's
21 "somewhat worse" than the long-term?

22 A. I don't know what the author means by that. It
23 would be hard for me to comment on it.

24 Q. Okay. Then, let's --

[WITNESS: O'Neal]

1 A. I had nothing to do with this.

2 Q. Then, let's look at Page 12. I'm looking at
3 the first paragraph, under the section called
4 "Conclusions and Recommendations", the last
5 sentence. Which reads "The predicted noise
6 levels do not exceed 45 decibels", which was
7 the limit on this particular project, "at any
8 of the receptors surrounding the project area,
9 and therefore no adverse impact related to
10 noise is expected during normal operation of
11 the wind farm." "Normal operation". Then he
12 goes on to say "Due to the variability in human
13 perception of noise and the potential
14 occurrence of higher noise levels [due to] some
15 meteorological conditions, certain noise
16 complaint mitigation measures may be required."

17 So, there again, he talks about
18 meteorological conditions that can result in
19 the turbines operating louder than what his
20 predicted model stated. Do you disagree that
21 that's possible?

22 A. I mean, that's what he's written there. But I
23 just -- I don't see the justification behind
24 it, the support for it.

[WITNESS: O'Neal]

1 Q. Okay. That's fine. Then, I want to now take
2 you to another document. This is one that I
3 handed out. This is WA-28x. It's a NARUC
4 document, the National Association of
5 Regulatory Utility Commissioners.

6 A. Yes. I have it.

7 Q. Okay. Now, this document was prepared on
8 behalf of the Minnesota PUC. It was funded by
9 the Department of Energy. And it was written
10 by Hessler Associates, which, again, will be
11 David Hessler. Okay? Now, this is a 69-page
12 document. I have the document in electronic
13 form in its full, but I only distributed those
14 portions that are specific to 9613.

15 Okay. So, now, Mr. O'Neal, again today,
16 and also on Tuesday, you defended your model
17 saying that it's been field tested and it works
18 very well, given a ground absorption factor of,
19 let's say, 0.5, and adding in the K factor, and
20 not making any or other adjustments. Is that
21 correct?

22 A. That is correct.

23 Q. Okay. So, then, I'd like to call your
24 attention to Page 12 of the document, it's not

[WITNESS: O'Neal]

1 a physical Page 12 page, but it has a "12" at
2 the bottom of the page.

3 A. Yes. I'm there.

4 Q. Okay. Thank you. And, then, the very last
5 sentence there, that starts "Extensive field
6 experience". This states "Extensive field
7 experience measuring operational projects
8 indicates that sound levels commonly fluctuate
9 by roughly plus or minus 5 decibels about the
10 mean trend line, and that short-lived (10 to 20
11 minute) spikes on the order of 15 to
12 20 decibels above the mean are occasionally
13 observed when atmospheric conditions strongly
14 favor the generation and propagation of noise."

15 So, do you disagree that atmospheric
16 conditions, meteorology, and a strong output,
17 full output from the turbines, can result in
18 noise levels that exceed the model?

19 A. I have never seen anything like what he
20 describes here, --

21 Q. Okay.

22 A. -- in our experience.

23 Q. All right. Then, let me take you to the very
24 last page of that handout, this would be the

[WITNESS: O'Neal]

1 page marked page "14". And here he's talking
2 specifically about the ISO standard, okay? And
3 he says, "after having" -- he starts with, this
4 is the last paragraph, "Having said that", he
5 goes, "it should be noted that the ISO 9613-2
6 does not consider atmospheric conditions, such
7 as wind and temperature gradients, stability,
8 turbulence, etcetera, and was always intended
9 to portray very long-term or average
10 propagation conditions under slightly
11 conservative downwind conditions."

12 Now, here he's talking generally about the
13 standard, which hasn't changed since 1992. Do
14 you disagree with what he's saying there?

15 A. Well, yes. It is intended to portray, I guess
16 I would disagree with the characterization of
17 "very long-term". If you go back and look at
18 the standard, it does talk about looking at
19 short-term events, but you can also look at
20 long-term, and that's where the meteorological
21 correction came in that Dr. Ward and I talked
22 about the other day. So, it can be used for
23 both short-term events and long-term events.

24 Q. I understand that. But, actually, the

[WITNESS: O'Neal]

1 operative phrases here, "the standard does not
2 consider atmospheric conditions, such as wind
3 and temperature gradients, stability,
4 turbulence, and was always intended to portray"
5 again.

6 A. So, yes. Those specific meteorological
7 parameters, like stability, turbulence, those
8 are not specific inputs to the standard. That
9 much is true.

10 Q. Not inputs, does the model -- does the model
11 actually account for any turbulence when the --
12 when it's run, or does it assume that there is
13 no turbulence or very little turbulence?

14 A. I mean, it would depend on the conditions under
15 which the IEC testing was done.

16 Q. This is the 9613 standard.

17 A. Right. But that testing then provides the
18 sound power levels, which go into the 9613
19 standard to do the propagation.

20 Q. Okay. Well, let me ask you a quick question
21 about that. I don't want to delve on the IEC
22 standard. But what is -- what is the expected
23 turbulence -- the shear coefficient for IEC?

24 A. I don't recall off the top of my head.

[WITNESS: O'Neal]

1 Q. Less than 2.2, does that ring a bell?

2 A. I believe it's -- I don't remember. I'm sorry,
3 I'd be speculating.

4 Q. Okay. Let me -- let's not deviate from here.
5 Then, if I --

6 PRESIDING OFCR. SCOTT: And, Ms.
7 Linowes, just thinking through -- I promised
8 Mr. Patnaude a break in the next few minutes.

9 MS. LINOWES: All right.

10 PRESIDING OFCR. SCOTT: So, think
11 through when might be a good time for a break
12 for you. I assume you have a fair amount of
13 questions left.

14 MS. LINOWES: You know what? As soon
15 as I finish this one document, we could take a
16 break, and then I could move on.

17 PRESIDING OFCR. SCOTT: Okay.

18 MS. LINOWES: Is that okay?

19 PRESIDING OFCR. SCOTT: Thank you.

20 BY MS. LINOWES:

21 Q. And, okay, so, Mr. O'Neal, just that next
22 sentence after where he goes on "Consequently,
23 the model" 9613 model, "results" -- "the model
24 results using this standard need to be

[WITNESS: O'Neal]

1 interpreted as the expected sound level under
2 average conditions, meaning that the actual
3 sound level will be close to the prediction
4 much of the time but higher and lower levels
5 will occur with about equal regularity due to
6 the fluctuating atmospheric conditions."

7 Do you disagree with that statement?

8 A. I see what he's saying there. I guess what I
9 would -- how I would answer that is, you know,
10 we have done extensive real-world sound level
11 testing, under, you know, for weeks and weeks
12 at a time, to capture a wide range of
13 meteorological conditions. And we haven't
14 experienced that.

15 So, again, haven't experienced the fact
16 that the model numbers then are woefully under
17 predicting reality. That is not true.

18 MS. LINOWES: Okay. Thank you. And
19 we could take a break now. And I'll continue.
20 Thank you.

21 PRESIDING OFCR. SCOTT: Okay. Steve,
22 how long -- off the record.

23 *[Brief off-the-record discussion*
24 *ensued.]*

[WITNESS: O'Neal]

1 PRESIDING OFCR. SCOTT: We'll do a
2 ten-minute break. Thank you.

3 (Recess taken at 10:49 a.m. and
4 the hearing resumed at 11:03
5 a.m.)

6 PRESIDING OFCR. SCOTT: Okay. Back
7 on the record. We're back with Ms. Linowes.

8 MS. LINOWES: Thank you,
9 Mr. Chairman.

10 BY MS. LINOWES:

11 Q. Mr. O'Neal, if I could get you to look at --
12 this would be the WA-26x that I handed out
13 earlier today. And the second question
14 attached, which is WA 1-10. And, again, this
15 is part of what I put into the record, a copy
16 of it. And I just want to -- this is a data
17 request that I made of you, where I asked to
18 you that -- it says -- states from your
19 testimony, you say "Antrim Wind Energy Project
20 will easily meet the standards set forth by the
21 New Hampshire Site Evaluation Committee in Site
22 301.14 for wind energy facilities", that's what
23 you say in your Attachment 9 testimony. And,
24 then I ask "Please state whether there are any

[WITNESS: O'Neal]

1 atmospheric conditions, temperature gradients
2 or wind shear gradients that could cause sound
3 levels at any given location to be higher than
4 what is predicted." And you did say "no" at
5 that time. So, that's consistent with what
6 you're saying today, is that correct?

7 A. That's correct.

8 Q. Okay. Now, what I'd like to do is call your
9 attention to my Exhibit WA-12. And this is a
10 Massachusetts CEC report called the
11 "Massachusetts Study on Wind Turbine
12 Acoustics". And, when you get a chance, if you
13 could go to Page 50 of that report.

14 A. Okay. Give me a second please.

15 PRESIDING OFCR. SCOTT: Did you say
16 5-0? Fifty?

17 MS. LINOWES: 5-0. And that's the
18 "5"- "0" on the page, not the pdf page.

19 BY MS. LINOWES:

20 Q. Do you see that? Are you on that page?

21 A. No, not yet.

22 Q. Okay.

23 PRESIDING OFCR. SCOTT: Ms. Linowes,
24 for us following along on the pdf, can you tell

[WITNESS: O'Neal]

1 us what page it would be on the pdf?

2 MS. LINOWES: Yes. I hope so.

3 PRESIDING OFCR. SCOTT: I'm hearing
4 "62".

5 MS. LINOWES: Okay.

6 PRESIDING OFCR. SCOTT: Thank you.

7 MS. LINOWES: I don't think my unit
8 here tells me. Oh, yes, it does. It's "62",
9 sorry.

10 WITNESS O'NEAL: Okay. I'm there.

11 BY MS. LINOWES:

12 Q. Okay. Thank you. Now, I want to go to the
13 last paragraph of that page. And, again, we're
14 going to talk -- I just want to briefly explore
15 the K factor for a second with you. Earlier
16 today you had testified to questions by
17 Dr. Ward that the test is conducted on flat
18 ground. You testified -- is that correct?

19 A. Again, I've never witnessed an IEC test, but
20 that's my understanding.

21 Q. Okay. You testified that the sound power level
22 of the turbine will not be louder when it's
23 moved to a ridgeline, correct?

24 A. Correct.

[WITNESS: O'Neal]

1 Q. Okay. You testified that Siemens guarantees
2 the sound level?

3 A. Correct.

4 Q. Okay. Have you seen the Siemens guarantee?

5 A. I have not seen it myself, no.

6 Q. So, the information you have today is that a
7 1.5 uncertainty factor is added to the apparent
8 sound power level, that's what you were given?

9 A. That's the documentation I was given, yes.

10 Q. Okay. So, now, if you would look on that last
11 paragraph, it says "Manufactures may use" --
12 let me go down for a second, it says
13 "Manufacturers may use the results from the
14 IEC...test", and it talks -- "and its reporting
15 requirements to guarantee to a purchaser the
16 sound emissions from their wind turbines." Do
17 you see that?

18 A. Yes, I do.

19 Q. So, that's consistent with what you said
20 earlier today?

21 A. Yes.

22 Q. And it says "However, that guarantee may be
23 lower or higher than the IEC 61400-11 tests
24 results. For example, in a guarantee, a

[WITNESS: O'Neal]

1 manufacturer may increase the declared sound
2 level to account for meteorological conditions
3 that may occur outside of the test conditions."

4 Do you see that?

5 A. Yes.

6 Q. To your knowledge, is that 1.5 a higher number
7 because it's accounting for meteorological
8 conditions that are different from the test
9 conditions?

10 A. I don't know.

11 Q. Have you ever seen where a manufacturer has
12 given a guarantee that's higher than that
13 number that you said generally falls between
14 one and two?

15 A. I have never seen a number higher than two from
16 different manufacturers.

17 Q. Okay. So, you don't know if that's accounting
18 for meteorological conditions?

19 A. Well, as I just answered, I don't know, within
20 this specific case, whether Siemens
21 incorporated some meteorological factor into
22 their K factor.

23 Q. And, again, you don't know of any turbine that
24 you ever worked with or did a noise study on

[WITNESS: O'Neal]

1 has incorporated that or not? Do you know?

2 A. The manufacturers just typically report the K
3 factor.

4 Q. Okay. Thank you. All right. So, now, what I
5 want to do now is -- bear with me for one
6 second to make sure I'm where I want to be.

7 Okay. Now, this study, this CEC study from
8 Massachusetts, you worked on this or you were
9 one of the authors?

10 A. We worked on it. We were not the author, the
11 primary author. That was Resource Systems
12 Group. But we were one of the participants in
13 the study.

14 Q. And you do list it on your CV. So, it was a
15 significant part of your work in recent years?

16 A. Yes. Definitely.

17 Q. Okay. So, if we could go to Page 56 now, and
18 this will be pdf 68.

19 A. Okay.

20 Q. Okay? Now, just so we understand at least what
21 a portion of this research involved, it
22 appears, in my reading, and I would like you to
23 tell me if I'm wrong, that there was some
24 effort to compare modeled -- the predictive

[WITNESS: O'Neal]

1 modeled results to actual running wind
2 projects, to see how well the model worked
3 against the actual output. Is that correct?

4 A. That's a fair summary, yes.

5 Q. And I think you stated on Tuesday that -- you
6 pointed out this was one example where you
7 found that there was very good comparisons
8 between modeled and actuals?

9 A. Yes. With the proper, appropriate settings,
10 yes.

11 Q. Right. And your settings, what you're using
12 today, is ground factor -- a G factor of 0.5
13 and a K factor of 1.5, and not adding any other
14 adjustments, correct?

15 A. That's correct.

16 Q. Okay. Thank you. Now, this chart, can you
17 help us understand what this chart is, this,
18 what you're seeing on that page, and including
19 explaining the axes?

20 A. Are you referring to Figure 17?

21 Q. I am, yes.

22 A. Okay.

23 Q. Yes. Thank you.

24 A. Yes. I understand that. We did not create

[WITNESS: O'Neal]

1 these figures. The RSG created them. They
2 are -- I think they are a little challenging to
3 look at and understand. But, essentially, what
4 they're plotting here, for various actual
5 measurement locations, and then after-the-fact
6 we went back and did some modeling and put a
7 model point at those same measurement
8 locations. These graphs, which you'll see on
9 the series of pages following here, plot
10 measured values versus modeled values, that's
11 essentially what it is. Measured versus
12 modeled, and then -- excuse me -- there's a
13 diagonal line that goes through there, where,
14 if you're on that or very close to that, that
15 means the measured matched up with the modeled.

16 Q. Uh-huh.

17 A. And then there are a series of other axes,
18 which talk about, you know, "did the modeling
19 always capture the highest or worst case that
20 was measured out in the field?"

21 Q. Okay. That's very helpful. Okay. So, let me
22 just ask you a couple of questions about the
23 chart after you just described that. If you --
24 you've done the model, okay. Now, you go out

[WITNESS: O'Neal]

1 in the field and take actual measurements. If
2 any of those actual measurements, actual noise
3 levels produced -- that are measured as coming
4 off the wind project fall into the green box,
5 which is the lower right quadrant, what would
6 that mean?

7 A. So, if one falls on that green box, that means
8 that the modeling under predicted the measured
9 value.

10 Q. So, if it under predicted it, it meant that
11 what?

12 A. It under predicted whatever the maximum was for
13 that particular case.

14 Q. Okay. So, let's -- in the context of Antrim
15 Wind, if I understand you correctly, the
16 maximum will be 38 decibels?

17 A. That's correct.

18 Q. Okay. So, if this were a real-world
19 experience, Antrim Wind is built, you go out
20 and do the post-construction noise study, you
21 would expect that there will be no measurements
22 of noise falling into the green quadrant, is
23 that correct?

24 A. That would be our expectation, yes.

[WITNESS: O'Neal]

1 Q. Okay. And that all of the measurements will
2 fall somewhere to the left of that diagonal
3 line, is that correct?

4 A. Left of the horizontal line.

5 Q. Left of the --

6 A. The horizontal line that separates the green
7 area, green-shaded area, from the pinkish --

8 Q. Okay.

9 A. -- pinkish-shaded area.

10 Q. Okay.

11 MR. IACOPINO: Vertical line.

12 PRESIDING OFCR. SCOTT: Vertical
13 line.

14 WITNESS O'NEAL: Oh, I'm sorry. I
15 said "horizontal".

16 MS. LINOWES: Thank you.

17 WITNESS O'NEAL: Thank you. I meant
18 "vertical". Thank you. Let the record reflect
19 I meant "vertical".

20 BY MS. LINOWES:

21 Q. Thank you. That is very helpful. Now, if I
22 can draw your attention to the colored page
23 that I sent out. This is actually in the
24 document on Page 65, or pdf Page 77, but, for

[WITNESS: O'Neal]

1 ease of viewing, I just printed it out. And I
2 wanted you to -- these are charts, that same
3 diagram, but now we're looking at a plot of
4 actual measurements. And there were several
5 wind projects that were evaluated in
6 Massachusetts, one of them being a mountainous
7 one, is that correct?

8 A. That's correct.

9 Q. Okay. So, the mountainous one will be
10 comparable to our Antrim Wind condition, would
11 you agree?

12 A. It would be the closest one.

13 Q. Okay. Now, in this mountainous one, I wanted
14 to go down to the third diagram, the one on the
15 bottom. And, if you notice, on the right-hand
16 side, they're using ISO 9613-2 standard.
17 They're adding in a G factor of 0.5, like you
18 did. And they're adding in a plus 2, which,
19 for that turbine, was the K factor. Do you
20 agree?

21 A. Yes.

22 Q. Okay. Now, Mr. O'Neal, can you talk to me,
23 talk to everyone here, about the results in
24 terms of points falling into that what would

[WITNESS: O'Neal]

1 have been the green quadrant, or right of the
2 vertical lines?

3 A. So, I'm sorry. You're looking at the third
4 graph, the one on the bottom?

5 Q. That's correct.

6 A. Yes. So, that's the one of the G of 0.5, plus
7 2. So, what you see in this graph, it's a
8 little cluttered, but what's being plotted here
9 are three different sets of locations. In
10 other words, there's three different
11 measurement locations here. The green one is
12 650 meters upwind of a turbine, the blue lines
13 are 670 meters downwind of a turbine, and the
14 red ones are 800 meters sort of crosswind from
15 a turbine. So, that's why there's sort of
16 three sets of symbols, three sets of colors.
17 So, you have upwind, downwind, crosswind.

18 So, if you look at that vertical line that
19 we were just looking at in the sample plot back
20 in Figure 17, you'll see that there are -- the
21 measured levels there are clustered pretty
22 close around. There's a lot of them on the
23 diagonal line, there's some clustered along the
24 vertical line, and there are a few that are a

[WITNESS: O'Neal]

1 decibel or two over than that, "over", that
2 means they're to the right. And, if you read
3 the report, there's actually a reason for that.

4 Q. Well, I get that.

5 A. Okay.

6 Q. We could come back to that.

7 A. Okay.

8 Q. I'm just -- the reason I'm asking you this is
9 you had put forward this document or this
10 study, you reference it in your testimony,
11 stating that this document shows that the
12 models work very well and over predict. What
13 is the -- what do those points in the lower
14 right-hand quadrant tell you, or those points
15 to the right of the vertical line, what are
16 they telling us?

17 A. They're telling us that the measured values
18 were a little bit higher than the modeled
19 values.

20 Q. So, under the condition that you used in your
21 own model, with a G factor of 0.5 and adding in
22 the K factor, in fact, what you found in
23 Massachusetts were under predictions, is that
24 correct?

[WITNESS: O'Neal]

1 A. Well, it's worth taking a second to explain
2 what --

3 Q. I just asked you "is that correct?"

4 MR. NEEDLEMAN: Well, let's have the
5 witness answer the question.

6 MS. LINOWES: Well, I asked the
7 question --

8 MR. RICHARDSON: It's important to
9 hear the answer as well. It's important to
10 allow the witness to answer.

11 BY MS. LINOWES:

12 Q. Well, I asked the question "is that correct,
13 that you have under predictions?"

14 A. These levels that look like they're under
15 predicted were from periods of time, and it's
16 discussed in the study, periods of time
17 immediately following a shutdown. Because we
18 did turbines on/turbine off measurements for
19 this program. And, so, if you turn the a
20 turbine off suddenly under 10 meter per second
21 winds, which we did to get a background sound
22 level, and then, of course, you turn it back
23 on, for the initial -- for a very brief period
24 of time, the blades are -- the blades are very

[WITNESS: O'Neal]

1 confused. So, it takes them a very, I don't
2 what the right -- 30 seconds, 60 seconds to
3 adjust back to the right time. So, for that
4 brief period of time, you're going to have
5 unusually higher sound levels. And that's what
6 happened in this case.

7 Q. Mr. O'Neal, --

8 A. Now, under normal operations, you're not going
9 to do that. This was done for a specific
10 testing scenario. I just wanted --

11 Q. I understand.

12 A. -- to explain why that is.

13 Q. But, if I could ask you then, if these were
14 anomalous conditions that were tied to the test
15 itself, why would they -- why would that data
16 even be here?

17 A. Again, that's --

18 Q. Would you -- if that's an act of observing has
19 caused a change and are nominally in the
20 results, why would that not -- that would not
21 make sense to now make any -- draw any
22 conclusions and put this in the data, they
23 would have removed those --

24 A. I think Resource Systems Group, the --

[WITNESS: O'Neal]

1 *[Court reporter interruption.]*

2 WITNESS O'NEAL: I'm sorry.

3 **CONTINUED BY THE WITNESS:**

4 A. I suspect Resource Systems Group, the author of
5 this, wanted to just present all the data. And
6 it is what it is, and then they went and dove
7 into it deeply and said "this is why we think
8 it appears that way."

9 BY MS. LINOWES:

10 Q. Okay. Then, let's go -- let us go to the
11 section of the document that you're talking
12 about where that one sentence is presented. I
13 want to go to Page 75, pdf Page 75, which is
14 also Page -- sorry. Page 63.

15 So, there's -- the third paragraph under
16 the section called "Multi-Turbine Mountain
17 Site", it says, and I'll read this to you. Do
18 you see where I'm at?

19 A. Yes.

20 Q. Okay. "Figure 24 shows the comparison for the
21 ISO 9613-2 model with...a G factor of zero, a G
22 factor of 0.5, and a G factor of 0.5 with
23 2 decibels added to the results." Do you see
24 that?

[WITNESS: O'Neal]

1 A. Yes.

2 Q. And you agree that those are what those three
3 charts are?

4 A. Yes.

5 Q. Okay. "For hard ground", which is a "G equals
6 zero", "the points are scattered around the
7 diagonal, indicating some under- and over-
8 predictions relative to specific wind speeds."
9 And then it talks about "However, none of the
10 monitored five-minute periods exceeded the
11 maximum [model]." Then, it talked -- now,
12 they're not making any statements there, are
13 they? They're not talking about, you know,
14 conditions under which they ran the tests, and
15 these anomalies because it was on and off and
16 on and off. I don't see any reference to it
17 there when G is equal to zero, do you?

18 A. The discussion follows later on in the report.

19 Q. I understand. But why would that not apply for
20 a "G equals zero" condition?

21 A. Again, they're just presenting the data.

22 Q. Okay. All right. Then, let's look at the next
23 paragraph. "For mixed ground (G equals 5)"
24 [0.5?], "the maximum modeled sound levels were

[WITNESS: O'Neal]

1 lower. Therefore, the corresponding lines
2 shift down to the left in the Figure,
3 increasing the number of under-predicted
4 points. With 2 decibels added, there was an
5 improvement, but several points exceeded the
6 maximum modeled sound level by as much as 2
7 decibels. Many of these under-predicted
8 periods occurred just after the turbine
9 restarted after a shutdown." "Many", not
10 "all". Do we know how many?

11 A. I can't. I don't know.

12 Q. Is it your testimony that turbines do not shut
13 off and turn on again in the field by
14 themselves, under normal operating conditions?

15 A. Under normal operating conditions, no, they
16 don't turn on and off. Obviously, if there's
17 a -- if something goes on mechanically, they
18 could shut down. But, no, they don't go on and
19 off.

20 Q. If there's not enough wind for the turbine to
21 run, does it turn off?

22 A. Yes.

23 Q. Okay. Thank you. And it turns on when the
24 winds kick in again?

[WITNESS: O'Neal]

1 A. When they are above the cut-in speed, they will
2 turn on, yes.

3 Q. Okay. So, that does happen in the real world?

4 A. Yes.

5 Q. Okay. Thank you. All right. So, now -- and
6 they also shut off when the winds are too high
7 as well?

8 A. There's a cut-out speed of 25 meters per second
9 where they will turn off.

10 Q. Okay. All right. Now, there's another
11 document that you had pointed to as proof that
12 the turbine modeling is very -- is very
13 accurate. And that would be what I referred to
14 as the "Wallace Report", and if you could bring
15 that up. That would be -- that would be my
16 WA-06.

17 A. You'll have to give us a minute please?

18 Q. Sure.

19 PRESIDING OFCR. SCOTT: We're off the
20 record.

21 *[Brief off-the-record discussion*
22 *ensued.]*

23 PRESIDING OFCR. SCOTT: Okay. Back
24 on the record.

[WITNESS: O'Neal]

1 BY MS. LINOWES:

2 Q. Okay. Mr. O'Neal, in your attachment, this
3 will be App. 33, Attachment 9, and I don't
4 think there's a need to go to that. But, on
5 Page 7-4, you make a statement that "two
6 ridgeline wind farms in Maine, Mars Hill and
7 Stetson Mountain I, were found to be below
8 modeled predictions even under worst case
9 operating conditions." Do you remember writing
10 that?

11 A. Yes.

12 Q. And then you also pointed to this Wallace paper
13 that I'm talking about. Correct?

14 A. Correct.

15 MS. LINOWES: Sorry, Mr. Chairman.

16 BY MS. LINOWES:

17 Q. Okay. Now, if you can go to Page 2 of that
18 report. It doesn't actually have page numbers.
19 So, it's the physical page 2. In the last
20 paragraph, it states "Informed by experiences
21 from over 2,000 hours of meter position
22 measurements recorded at 7 to 9 positions at
23 Mars Hill, RSE's already conservative modeling
24 approach became even more conservative. On all

[WITNESS: O'Neal]

1 subsequent projects, RSE's models included
2 reported uncertainties in the apparent sound
3 power levels (plus 2)". That would be the K
4 factor, correct?

5 A. Correct.

6 Q. "And published limitations inherent in ISO
7 Standard 9613 of 3 decibels." Do you see that?

8 A. Yes.

9 Q. Okay. In other words, they added 2 decibels
10 for the K factor, which you add in, you add the
11 1.5 for the Siemens, and they also added in the
12 3 for the ISO Standard, correct?

13 A. Correct.

14 Q. Okay. Now, I want to draw your attention to
15 Figures 9, 10, and 11 in that report. These
16 are after all of the text. They would be on
17 Page, pdf Page -- I don't know what the -- pdf
18 Page 16. Now, all of these are basically the
19 same. So, we'll focus on the one, the Leq one,
20 which would be the third one, the one on the
21 bottom of the page, if we can, Figure 11.

22 Okay. Now, do you recognize this chart?

23 A. Yes. I'm there.

24 Q. Okay. And you've seen this before?

[WITNESS: O'Neal]

1 A. Yes.

2 Q. Okay. And that solid orange line that you see
3 there, those are the modeled results from that,
4 before any adjustments were made. Do you see
5 that?

6 A. Yes.

7 Q. And, then, the small dash line is the adding in
8 of the turbine uncertainty, which is the plus 2
9 in this case, your 1.5, correct?

10 A. Yes.

11 Q. And, then, also the dark -- the large dash line
12 would be adding in the 3 for the ISO, plus or
13 minus 3 decibel correction. Do you see that?

14 A. I do see it, yes.

15 Q. Which you say doesn't have to be done, correct?

16 A. Correct.

17 Q. Okay. Now, in their measurements, those blue
18 dots now are actual measurements of turbine
19 noise coming from the project, okay? Now, what
20 I want to concentrate on are the blue dots that
21 appear above the small dash line, the small
22 dash, which is would be comparable to what you
23 are stating should be done. I should say for
24 the record, this was using a ground -- G factor

[WITNESS: O'Neal]

1 of 0.5 as well. Now, do you see how many
2 actual numbers, actual recorded noise levels
3 exceeded the plus 2? Do you see that?

4 A. I do see some, yes.

5 Q. Okay. So, they had a very different
6 experience. This is a document that you
7 pointed to as showing that the projects are --
8 that the model is very -- works very well. And
9 what is this actually showing here at Mars
10 Hill?

11 A. I was actually commenting on the Stetson, the
12 Stetson results, a little bit further back.

13 Q. I understand. I appreciate that. But I'm
14 asking you about this portion of it.

15 A. This portion? This shows some of them above
16 that, yes. Yes.

17 Q. So, there were under predictions with the
18 model, even when they added -- when they just
19 added in the turbine uncertainty, correct?

20 A. Correct.

21 Q. Okay. And, now, I'd like to call your
22 attention to WA-27-x, if I may. This is a
23 letter that I handed out earlier today. This
24 letter is written from the State of Maine

[WITNESS: O'Neal]

1 Department of Environmental Protection, to
2 First Wind, which is the company that had owned
3 the Mars Hill Project. And I wanted to go to
4 the second page there, about the fifth line
5 down. And it begins towards the end of the
6 line. It says "The Department recognizes that
7 Mr. Brown", Mr. Brown was the consultant
8 working with the State of Maine on acoustics
9 issues, "found the data at monitoring location
10 MP-8 to be up to 2 decibels over the allowed
11 limit of 5 decibels."

12 DR. WARD: Fifty.

13 BY MS. LINOWES:

14 Q. -- "50 decibels for approximately 15 percent of
15 the time." So, in fact, the actual operating
16 project was found to be even higher output
17 noise level than what the model did, even with
18 the plus 2 and the plus 3?

19 A. I guess -- I guess I don't see the direct link
20 from this comment to the graph in the paper
21 there.

22 Q. Okay. Then, we can move on. We won't spend a
23 lot of time on that. Now you -- let's see.
24 So, now, let's talk about what you wanted to

[WITNESS: O'Neal]

1 show in this report. You have used this
2 Wallace report or paper to bolster your
3 statements that adding a 3 dB adjustment is not
4 necessary, is that correct? And you pointed to
5 Figure 16 of the report?

6 A. Well, it's -- this is just one other piece of
7 information. It's based on this, plus our
8 other experience measuring other wind farms.
9 But, yes.

10 Q. Yes. Okay. So, let's go -- let's talk about
11 Figure 16 then. This would be pdf Page 18.
12 Now, actually, let's look at the figure just
13 above it, which is a aerial photo with the
14 contours of the noise limits. You can see the
15 turbines there. Do you see that?

16 A. Yes.

17 Q. Okay. Now, isn't it true that Mr. Wallace, who
18 wrote, and RSE, who prepared this paper, when
19 they -- okay, so, actually, why don't you set
20 up. What was going on here? What is it
21 that -- why you wanted to look at this?

22 A. Well, I was trying to become informed by
23 looking at this, at their experience at another
24 ridgeline wind farm, where they modeled the

[WITNESS: O'Neal]

1 sound levels using a G factor of 0.5. And they
2 then added additional -- the 2 decibel
3 uncertainty for the manufacturer, the K factor,
4 and then another 3 decibels. And, when they
5 got out there and actually measured, they saw
6 that, under the worst case sound conditions,
7 the highest operating conditions, that the
8 sound levels were below, essentially, that that
9 additional 3 decibels was not needed. It was
10 overstating the results.

11 Q. Now, Mr. O'Neal, when you say the "full sound
12 power operations", don't they say in the report
13 it's "during full sound power under stable
14 atmospheric conditions"?

15 A. Could you show me where that is in the report?
16 I don't recall.

17 Q. Yes. It would be on -- I forgot to write the
18 page number down. So, let me just get it to
19 you. It would be in the body of the text on
20 Page --

21 MS. LINOWES: Sorry, Mr. Chairman.

22 BY MS. LINOWES:

23 Q. If you would go to Page 7, pdf Page 7. And
24 this would be the paragraph about the fourth --

[WITNESS: O'Neal]

1 third or fourth paragraph down, it starts "The
2 essence of the Rollins Protocol". Do you see
3 that?

4 A. Yes.

5 Q. It says "The essence of the Rollins Protocol is
6 to measure operations in one or more downwind
7 positions during full power" -- "full sound
8 power operations under stable atmospheric
9 conditions." And then it says "Atmospheric
10 stability is defined as no one-second wind
11 speed above 2.7 meters per second."

12 So, are we talking about turbulent
13 conditions up above?

14 A. We're talking about very strong wind shear
15 conditions. In other words, those kind of
16 stable atmospheric conditions lend itself to
17 that. In fact, if you look at the wind speed
18 information in that Figure 16 at the very end
19 of the paper, you can see that the wind speeds
20 up at the turbine hub height were between 25
21 and 30 miles an hour, and the wind speeds down
22 at the ground in the valley were, well, 2 to 3
23 miles per hour.

24 Q. But are we talking about a -- and I hate to

[WITNESS: O'Neal]

1 bring it up, but a strong inversion here?

2 Where it's calm on the ground, and the winds

3 may be quite erratic up above, above that

4 boundary?

5 A. Well, I would certainly suggest that is --

6 Q. Or not?

7 A. -- that is case.

8 Q. Or not? Or not? I mean, really, do you know?

9 A. I can't -- I don't --

10 Q. Do you know what the conditions were above of

11 the wind?

12 A. There is no stability information provided in

13 the paper.

14 Q. Correct.

15 A. Again, judging from the strong wind speeds up

16 at the ridge, and the light winds down at the

17 valley, I would suggest yes.

18 Q. But you don't know, do you?

19 A. It don't have --

20 Q. It could be a very steady wind.

21 MR. RICHARDSON: Could we let the

22 witness answer.

23 MS. LINOWES: Okay.

24 MR. RICHARDSON: I'm been trying to

[WITNESS: O'Neal]

1 follow, and it's just --

2 PRESIDING OFCR. SCOTT: Thank you.

3 And, also, if you could do one at a time,
4 again, this is to be transcribed. So, the
5 normal conversation flow is a little different
6 on these type of proceedings, right? So, you
7 need to let --

8 MS. LINOWES: Yes.

9 PRESIDING OFCR. SCOTT: -- the
10 witness finish answering, and then you would go
11 back. Thank you.

12 MS. LINOWES: Thanks, Mr. Chairman.

13 BY MS. LINOWES:

14 Q. Now, with regard to that figure, Mr. Wallace
15 only tested one location, didn't he?

16 A. I believe he tested at other locations. That's
17 the one that's plotted up and graphed.

18 Q. If you read the report, have you read the
19 report?

20 A. I have.

21 Q. Do you see where he says he tested in more than
22 one location, using this method that you say
23 would -- is better?

24 A. I'd have to go back and refresh myself on it.

[WITNESS: O'Neal]

1 Q. Would you like me to read it to you?

2 A. Sure.

3 Q. It will be on that same page that we were just
4 looking at, second paragraph. In the middle of
5 the paragraph, it says "LURC", which was the
6 agency in the State of Maine, "compliance
7 measurement positions CP-1, 2 and 3 were
8 supplemented with a dominant position C-4.
9 CP-4 was selected as the best available and
10 ideal position for testing all aspects of the
11 Rollins Protocol".

12 A. Yes. So, it appears they have added the CP-4
13 as another testing location, correct.

14 Q. Did they run -- this method that you're saying
15 proves that the model is better, if we follow
16 RSE's method, how many data points did he test?

17 A. From this paper, it appears CP-4 was the only
18 one.

19 Q. Okay. Thank you. And wouldn't an acoustician
20 typically work to get sound levels at multiple
21 locations and distances to increase his
22 confidence in the understanding of the sound
23 emissions?

24 A. And that's absolutely what we've done, and

[WITNESS: O'Neal]

1 based on our experience.

2 Q. But that experience is not in the record. Have
3 you put that experience in the record?

4 A. Page 7-4 of the Sound Level Assessment Report
5 is where we mention it.

6 Q. And what does that say?

7 A. "This conservative set of modeling assumptions
8 have been verified multiple times through
9 post-construction sound level measurement
10 programs at operating wind farms, for example",
11 and I list the Groton Wind as one example. I
12 then cite the Stetson I and the Mars Hill paper
13 here. Also, another one in the Midwest is
14 listed here as well.

15 Q. But those documents are not in the record?

16 A. The Groton Wind one is.

17 Q. Not in this record.

18 MR. NEEDLEMAN: Well, I don't think
19 we need to argue about whether they're in or
20 not. They're in his report, and they're
21 referenced here, and he's relied upon them.

22 MS. LINOWES: The point is, none of
23 the parties here have access to the data in
24 order to assess your statement that whether or

[WITNESS: O'Neal]

1 not they are accurate.

2 MR. NEEDLEMAN: And, Mr. Chair, I
3 think we're arguing at this point. And the
4 parties were certainly free to request this
5 data at any point if they wished to.

6 MS. LINOWES: All right.

7 PRESIDING OFCR. SCOTT: Sounds like
8 we're moving on, are we?

9 BY MS. LINOWES:

10 Q. So, you're making an assertion today that one
11 statement in your report is enough to make the
12 case that you're -- we've already shown that
13 the Wallace paper only looks at one point,
14 correct?

15 MR. NEEDLEMAN: I'm going to object.
16 It's a mischaracterization of his testimony.

17 MS. LINOWES: Okay.

18 MR. NEEDLEMAN: That's not what he
19 said.

20 MS. LINOWES: It's not what he said?

21 BY MS. LINOWES:

22 Q. Does the Wallace paper use only one data point?

23 A. It uses one data point at Stetson, yes.

24 Q. Okay. Now -- okay. So, let's move on then.

[WITNESS: O'Neal]

1 There, on Page 2, Line 8, of your supplemental
2 testimony, this would be App. 21. You state
3 that "There were five fewer receptors analyzed
4 in the 2016 Sound Report as compared to the
5 2015 Sound Report." Do you see that?

6 A. Yes, I do.

7 Q. And, now, you didn't -- you took those five
8 data points out, but never stated that you took
9 them out of your report. Why is that?

10 A. Because, after the new SEC rules came out in
11 December, we looked at them. And one of those
12 five locations was a dilapidated hunting camp,
13 Mr. Courturier, sorry if I'm mispronouncing his
14 name, because that does not meet the definition
15 of a "residence". The other four locations are
16 participating landowners. They have agreements
17 with Antrim Wind. And, in any event, all those
18 locations are still below 40 decibels, even if
19 they were included.

20 Q. Okay. So, you decided, from 2015 Report to
21 2016 Report, that these properties do not need
22 to be in there then? You're saying that,
23 because Mr. Courturier's property is not a
24 home, you took it out. But you did include

[WITNESS: O'Neal]

1 sheds, you include barns, you include other
2 structures, but this one came out. Why did
3 this one came out, because it was dilapidated?

4 A. It was a dilapidated hunting -- or, is a
5 dilapidated hunting camp, no running water or
6 electricity. In terms of the sheds and the
7 barns that are also structures in other parts
8 of the study, Antrim Wind provided a full
9 database of locations, and did not -- did not
10 remove those non-residential structures. So,
11 we just left them in.

12 Q. Are you aware that the SEC rules make no
13 distinction between participating landowners
14 and non-participating landowners in the rules?

15 A. I am, yes.

16 Q. So, you still pulled those properties out that
17 were participating landowners, why?

18 A. Well, again, they have agreements with Antrim
19 Wind Energy, for both sound and flicker. And,
20 therefore, those locations are -- well, they're
21 still less than the standard anyway. But those
22 locations were not felt to be ones of real
23 interest.

24 Q. So, you're saying, by virtue of a private

[WITNESS: O'Neal]

1 agreement between a landowner and Antrim Wind,
2 where they can decide, they are not, between
3 themselves, subject to the rules? Is that what
4 you're saying?

5 A. I don't know what's in the agreement. I just
6 know that Antrim Wind has an agreement with
7 them as participating landowners.

8 Q. But you decided, between 2015 and 2016, to pull
9 them out, correct?

10 A. Yes.

11 Q. Okay. And, just for everyone's reference, I
12 believe that this, if you can turn to the last
13 pages of WA-26x, there should be two pages
14 attached to that that have tables. Each table
15 is a "Table 7-5". And the first one that you
16 come to is from the Sound Report that was filed
17 in 2015, App. 33, Appendix 13a. And, then, the
18 second one attached came from the updated Sound
19 Power Study, App. 33, Attachment 9. And the
20 properties we're talking about are those first
21 few at the top, the hunting camp, etcetera.

22 Okay.

23 So, now, just so we're clear, you have
24 stated that your model is accurate, you don't

[WITNESS: O'Neal]

1 need to add the plus 3, but you do have the
2 decibel levels here in tenths of a degree -- I
3 mean, tenths of a decibel. What is the
4 capability of a meter, a sound meter? What
5 does that measure to?

6 A. I mean, an actual sound meter to measure can
7 measure down to tenths of a decibel.

8 Certainly, this --

9 Q. When you're at this frequency, though?

10 A. Yes.

11 Q. So, it measures down to a tenth?

12 A. Yes.

13 Q. Okay. So, you're saying that Mr. Courtier's
14 property, at "39.8", is below 40?

15 A. Yes.

16 Q. Okay.

17 MR. IACOPINO: Wait a minute. That
18 wasn't determined by using a sound meter,
19 though, was it?

20 WITNESS O'NEAL: You are correct.

21 These are modeled numbers, of course.

22 MS. LINOWES: And the reason I'm
23 asking about the meter is could he actually
24 measure that.

[WITNESS: O'Neal]

1 Okay. So, now, I just have a couple
2 more questions on sound, and then I have
3 questions on shadow flicker. I don't know if
4 you want to break for lunch between the noise
5 and the shadow flicker, but --

6 PRESIDING OFCR. SCOTT: Why don't we
7 see where we are, and then maybe.

8 MS. LINOWES: Okay.

9 BY MS. LINOWES:

10 Q. So, now, I did have a couple of other questions
11 for you. This is -- I would like you, I don't
12 know if this is cumbersome to do, but I would
13 like you to go to Mrs. Block's testimony. This
14 would be. Actually, I'm not sure what her
15 number is. Let me just check on that.

16 MR. IACOPINO: Mrs. Block's?

17 MS. LINOWES: Yes. That's correct.

18 That would be NA-11.

19 BY MS. LINOWES:

20 Q. If we could go to Page 30 of 34.

21 PRESIDING OFCR. SCOTT: And, Ms.
22 Linowes, is that the pdf location or is that
23 the actual number?

24 MS. LINOWES: Oh, I'm sorry. That's

[WITNESS: O'Neal]

1 the pdf location.

2 PRESIDING OFCR. SCOTT: Thank you.

3 MS. LINOWES: Pdf Page 34 -- 30 of
4 34. It should be a simulation of the turbines
5 overlooking Gregg Lake.

6 MR. KENWORTHY: We're still trying to
7 find it.

8 MS. WALKLEY: My computer is not
9 responding, sorry.

10 PRESIDING OFCR. SCOTT: Off the
11 record while we're trying to get everybody on
12 the same page.

13 *[Brief off-the-record discussion*
14 *ensued.]*

15 PRESIDING OFCR. SCOTT: Back on the
16 record.

17 BY MS. LINOWES:

18 Q. You see a simulation there of turbines
19 overlooking Gregg Lake?

20 A. Yes.

21 Q. Okay. Now, it was stated earlier, and I do
22 know it's in the standard, that if you are
23 predicting noise over water you would use a G
24 equals zero, is that correct?

[WITNESS: O'Neal]

1 A. Correct.

2 Q. Okay. Have you accounted for this condition,
3 where we have a large body of water, and looked
4 at what the noise levels would be across Gregg
5 Lake as a result of that body of water being
6 there?

7 A. I'm just going to take a minute and look at the
8 sound study.

9 Q. And, while you're doing that, the same holds
10 for Willard Pond, although I'm not going to
11 bother bringing that image up.

12 A. Okay. I'm there. So, there's a few -- there
13 are some residents along the shore of Gregg
14 Lake, absolutely. And this is, frankly, part
15 of the reason you would use -- we used a G
16 factor of 0.5. It's a mix of reflective for
17 part of the -- part of, and I suggest that
18 almost all of the intervening terrain, from the
19 ridgeline of the wind farm, down to the folks
20 at Gregg Lake, is forested and porous. A
21 little bit there around Gregg Lake is
22 certainly -- could be reflective. So,
23 therefore, the G of 0.5 would take that into
24 account.

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[WITNESS: O'Neal]

1 Q. So, you didn't actually look at the lakes and
2 look at what the factor would be?

3 A. We did not add a separate factor for the lake,
4 no.

5 Q. Okay. Thank you. Now, on Tuesday, you were
6 asked "what would happen if the Project was
7 found to be out of compliance?" And you
8 suggested that there are various actions that
9 could be taken, including adding noise
10 reduction operations, correct?

11 A. Correct.

12 Q. Okay. Now, you're aware that such NRO
13 mechanisms only drop the turbine noise levels
14 by, I think, 1 to 2 decibels, correct?

15 A. That is not correct.

16 Q. How much would it drop it by?

17 A. So, the NRO feature on a turbine steps down in
18 one decibel increments, but it can go all the
19 way down to as much as 5 decibels.

20 Q. Okay. And at what -- what would the amount of
21 reduction in energy output be as a result of
22 that?

23 A. That I don't know.

24 Q. Okay. What is it when it's 1 or 2?

[WITNESS: O'Neal]

1 A. Again, I don't have the NRO technical
2 documentation. So, I don't know what that
3 number is.

4 Q. Okay. So, there is a economic impact on the
5 project, though, correct?

6 A. If you do that, yes, there's an economic
7 impact, right.

8 Q. Okay. And, then, last question, on noise.

9 *[Court reporter interruption.]*

10 PRESIDING OFCR. SCOTT: Off the
11 record.

12 (Short pause.)

13 PRESIDING OFCR. SCOTT: Back on the
14 record. Thank you.

15 MS. LINOWES: Thank you.

16 BY MS. LINOWES:

17 Q. Ms. Berwick had asked you earlier today -- or,
18 rather on Tuesday, about the difference between
19 a 14 decibel and a 13 decibel experience,
20 knowing that her property had a -- has
21 currently a pre-construction sound as low as
22 14 decibels. Do you remember that question?

23 A. You said "14 decibels and 13 decibels".

24 Q. Fourteen (14) and 36. Fourteen (14) decibels

[WITNESS: O'Neal]

1 today, L90, going up to 36 as a result of the
2 project being operational.

3 A. I do recall the question, yes.

4 Q. Okay. And you said that, during those periods
5 when the turbines are operating, the wind will
6 be blowing, so it will be unlikely we would be
7 measuring a 14 decibel level in her backyard.
8 Do you remember that, saying that?

9 A. I'm not sure I said what you just said.

10 Q. Okay. Perhaps --

11 A. If you have a sound level of 14 decibels, that
12 means there's certainly no wind blowing
13 anywhere around. And, if it's that calm -- if
14 it's calm at the ground like that, it is -- it
15 is really not conceivable that it could be
16 blowing up on the ridge top at, you know, the
17 sound power levels that we're talking about
18 here.

19 Q. Okay. So, just to circle back then, didn't you
20 just say in the Wallace paper that they were
21 operating in very stable conditions on the
22 ground, but powerful wind conditions up at the
23 hub?

24 A. That's right. But it is not calm at the

[WITNESS: O'Neal]

1 ground. There's a difference between "calm"
2 and "3 miles per hour".

3 Q. So, are you -- but isn't it true that there are
4 meteorological conditions, such as
5 well-developed, ground-based temperature
6 inversions, which commonly occurs on clear
7 nights, we've heard that already. Where the
8 turbines can be operating at full power and
9 there could be no wind on the ground?

10 A. I would agree with you up to the part of "no
11 wind on the ground". There would be light --
12 there could light wind on the ground.

13 Q. Could be light.

14 A. Could be light, but not "no wind".

15 Q. Okay. So, instead of 14 decibels, 20 decibels
16 then perhaps in her backyard?

17 A. I don't have the exact -- I can't tell you the
18 exact answer, I don't know.

19 Q. But it would -- that is possible it could be
20 very calm by her home, and the turbines can be
21 operating at full power?

22 A. The turbines can be operating at full power,
23 and the winds could be light at the ground,
24 down, you know, anywhere on Reed Car Road or

[WITNESS: O'Neal]

1 down, you know, further in the valley.

2 Q. And, if it's very calm on the ground, we're
3 talking, say, 3 mile an hour wind, a gentle
4 breeze, is that producing noise?

5 A. I'll have to -- I just have to be strict
6 about that you said "very calm". It's either
7 "calm" or "not calm".

8 Q. Okay.

9 A. So, "calm" is --

10 Q. Calm, clear night -- clear, calm nights, as the
11 standard says, "clear, calm nights".

12 A. And those would engender a temperature
13 inversion, where you could have strong winds up
14 on the ridge and light winds down at the
15 ground, absolutely.

16 Q. So, the statement that she would -- it would
17 not be 14 decibels in her backyard, you don't
18 really know? It could be very quiet in her
19 backyard?

20 A. It wouldn't be 14, but it would be something
21 else. It could be still relatively quiet,
22 sure.

23 MS. LINOWES: Okay. Thank you. I am
24 ready to do shadow flicker, or we can wait.

[WITNESS: O'Neal]

1 PRESIDING OFCR. SCOTT: What's the
2 will of the Subcommittee? Do we want to press
3 on or we could take a lunch break? What's the
4 -- Lisa, how long do you -- Ms. Linowes, how
5 long do you --

6 MS. LINOWES: Actually, if I could
7 ask if we could take a lunch break now, just so
8 I can recover, maybe the witness wants to
9 recover, too. If that would be acceptable?

10 PRESIDING OFCR. SCOTT: So, that
11 would work for you better? So, okay. Why
12 don't we do that. We'll take a 45-minute lunch
13 break.

14 MS. LINOWES: Thank you very much.

15 (Lunch recess taken at 11:55
16 a.m. and concludes the **Day 4**
17 **Morning Session**. The hearing
18 continues under separate cover
19 in the transcript noted as **Day 4**
20 **Afternoon Session ONLY**.)

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