

In Re:
SEC 2015-02 ANTRIM WIND ENERGY
Hearing on the Merits

DAY 3 - AFTERNOON SESSION ONLY
September 20, 2016

SUSAN J. ROBIDAS, N.H. LCR
30 James Pollock Drive
Manchester, New Hampshire 03102
(603) 622-0068 or (603) 540-2083
shortrptr@comcast.net

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STATE OF NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

September 20, 2016 - 12:50 p.m.
Public Utilities Commission
21 South Fruit Street - Suite 10
Concord, New Hampshire

AFTERNOON SESSION ONLY

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

PRESENT FOR SITE EVALUATION SUBCOMMITTEE:

- Cmsr. Robert R. Scott Public Utilities Commission
(Presiding as Presiding Officer)
- Cmsr. Jeffrey Rose Dept. of Resources &
Economic Development
- Dr. Richard Boisvert Dept. of Cultural Resources/
(Designee) Div. of Historical Resources
- John S. Clifford Public Utilities Commission/
(Designee) Legal Division
- Dir. Eugene Forbes Dept. of Environ. Services/
(Designee) Water Division
- Patricia Weathersby Public Member

Also Present for the SEC:

- Michael J. Iacopino, Esq. (Brennan...)
- Marissa Schuetz, SEC Program Specialist

COURT REPORTER: Susan J. Robidas, NH LCR No. 44

1 APPEARANCES:

2 Reptg. Antrim Wind Energy (Applicant):
3 Barry Needleman, Esq. (McLane...)
4 Rebecca S. Walkley, Esq. (McLane...)
5 Henry Weitzner (Antrim Wind Energy)
6 Jack Kenworthy (Antrim Wind Energy)

7 Reptg. Counsel for the Public:
8 Mary E. Maloney, Esq.
9 Asst. Atty. General
10 N.H. Attorney General's Office

11 Reptg. the Town of Antrim:
12 Justin C. Richardson, Esq. (Upton...)
13 Robert Edwards, Selectman

14 Reptg. Harris Ctr. for Conservation Ed.:
15 Stephen Froling, Esq.
16 James Newsom, Esq.

17 Reptg. Audubon Society:
18 Francie Von Mertens
19 Carol Foss

20 Reptg.Reptg. Abutting Landowners Group:
21 Barbara Berwick, pro se
22 Bruce Berwick, pro se

23 Reptg. Allen/Levesque Group:
24 Mary Allen, pro se

Reptg. Meteorologists Group:
Dr. Fred Ward

Reptg. the Wind Action Group:
Lisa Linowes

Reptg. the Griffin/Pratt Group:
Benjamin Pratt

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I N D E X

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

2 (Afternoon session resumed at 1:28 p.m.)

3 PRESIDING OFFICER SCOTT: We're ready
4 to reconvene here. We'll go back on the
5 record. I think we're now at Counsel for the
6 Public, with Mr. Magnusson as the panelist.

7 CROSS-EXAMINATION

8 BY MS. MALONEY:

9 Q. Hi. Good afternoon. And I'm going to focus on
10 the microphone. So if I'm not looking at you
11 directly, that's what -- if I don't, then I
12 don't speak into the microphone.

13 I just wanted to follow up on some
14 questions that some of the intervenors had for
15 you. When it comes to your economic -- your
16 study on the economic impact, I believe you
17 said that you based this on assumptions that
18 were given to you by Antrim Wind; is that
19 correct?

20 A. That was part of the information that was taken
21 into account. Not all of it, but a portion.

22 Q. Right, right. So I think in response to one of
23 the questions, you took the PILOT into account.
24 You didn't look at the ad valorem analysis.

1 A. That's correct.

2 Q. Also the number of full-time or full-time
3 equivalent jobs, would that have been provided
4 for you by the Applicant?

5 A. For the ongoing direct full-time equivalent,
6 that was given by Antrim Wind. So that would
7 be the one they said would be direct employees
8 and related.

9 (Court Reporter interrupts.)

10 A. So, just to restate it, Antrim Wind had
11 indicated that there would be four full-time-
12 equivalent employees employed at the facility
13 after it was constructed.

14 Q. And so the indirect, you did an estimate of
15 that?

16 A. That's right. That uses the -- that was the
17 economic model portion, because those aren't --
18 wouldn't be able to be directly provided by
19 anyone. It would be a result of an economic
20 model that would generate that type of
21 information.

22 Q. Okay. Well, what other assumptions were you
23 given by Antrim Wind?

24 A. So, going back to the Economic Impact

1 Statement --

2 Q. Yeah.

3 A. -- Page 13, there's a good summary of the
4 different assumptions that were used in the
5 study. So, related to Antrim Wind, one would
6 have been they provide information on funds
7 already expended, plus their capital
8 expenditure projection, the information on the
9 PILOT agreement. The information they provided
10 was one of the assumptions built into the
11 model.

12 Q. Okay. Were there any others on Page 13?

13 A. And then, kind of related to your previous
14 question, for ongoing operations there will be
15 an average of four full-time equivalent jobs,
16 combination of direct employees of Antrim Wind
17 Energy, LLC, and contracted employees of the
18 wind turbine manufacturer based on information
19 provided by Antrim Wind Energy, LLC.

20 Q. For the money that was already spent on the
21 Project, at least at the top of your analysis,
22 you said they spent \$4.5 million?

23 A. That's correct.

24 Q. And 48 percent of that was spent in New

1 Hampshire?

2 A. That would have been based on reviewing
3 information that was in what they provided,
4 yes.

5 Q. At that time. And I understand that may have
6 changed. So that's about \$2.16 million spent
7 in New Hampshire? I just did the math, so...

8 A. That sounds reasonable.

9 Q. Do you have a breakdown on how that was spent?

10 A. No. Due to confidentiality, wasn't allowed to
11 disclose beyond just the aggregate figure.

12 Q. And would any of that have included legal fees?

13 A. I believe legal fees were one of the items
14 listed.

15 Q. Okay. I wanted to follow up on questions
16 regarding property values. I believe you said
17 that if a property -- you used the word
18 "speculation" with respect to an opinion that a
19 property value had decreased as a result of a
20 wind turbine farm being in a view; is that
21 correct?

22 A. I did make that statement.

23 Q. Okay. I'm sure you're aware that in almost
24 every community a view is considered part of

1 the property tax value -- part of the value of
2 the property; isn't that correct?

3 A. View definitely can be a factor that impacts
4 value of a property, yes.

5 Q. Okay. And Ms. Linowes give you some examples
6 of some property taxes that were lowered as a
7 result of an assessor's opinion that the view
8 was impacted, and you thought that was
9 speculation?

10 A. That's correct.

11 Q. So you don't believe an assessor's qualified to
12 make that determination?

13 A. I believe that, based on the evidence that's
14 been collected, that assessors do a very good
15 job of -- an assessed value of a property is a
16 very good predictor of what its sales price is.
17 So that would imply that overall assessors do a
18 good job of assessing the value of a property.

19 Q. Okay. You said you looked into the properties
20 sold in the Lempster area; is that correct?

21 A. That is correct.

22 Q. As part of that process, did you look into how
23 long some of the properties were on the market?

24 A. The study did not specifically look at length

1 of time for sale.

2 Q. Did you look into properties that had been put
3 on the market and then withdrawn?

4 A. No.

5 Q. Do you know how many properties in Antrim will
6 have -- how many residential properties will be
7 affected by the view, or what the effect it
8 will have a view of the turbines?

9 A. The result of the study would indicate that
10 none of the properties would be impacted in one
11 way or another by the view itself.

12 Q. I think I asked a different question.

13 A. Okay.

14 Q. I said, do you know how many residential
15 properties in Antrim will have a view of the
16 turbines?

17 A. I do not know the exact number.

18 Q. I wanted to ask you a couple of questions about
19 your study on tourism. I'm going to switch
20 documents here.

21 You were looking in Lempster in
22 particular. I think I'm on Page 8 of that
23 study. That's where you indicate that the
24 introduction of Lempster Wind appears to have

1 had little or no impact on the meals and rooms
2 sales in the region; correct?

3 A. Again, this isn't a study that I did, but one
4 that I reviewed. But that was a finding.

5 Q. Okay. And the four factors you have there are:
6 Meals and rooms, growth in tourism-related
7 employment, state park revenues, and weekend
8 traffic volume. If you need to take a moment,
9 go ahead.

10 A. Are you asking me if that's --

11 Q. Those were the factors you listed on Page 8.

12 A. Those were findings of the study that I felt
13 were particularly relevant.

14 Q. With respect to the state park revenues, what
15 kinds of amenities are at the Pillsbury State
16 Park for users as opposed to the Audubon
17 Wildlife Sanctuary? Did you do a comparison?

18 A. Again, I didn't look at tourism, so I didn't do
19 a direct comparison between Pillsbury and any
20 other park.

21 Q. Okay. Would you agree they're different?

22 A. Can you clarify what you mean by "different"?

23 Q. They offer different amenities.

24 A. Can you be more specific?

1 Q. Picnicking, boating, camping.

2 A. I mean, I've visited both places. And just
3 from my recollection of being there, I remember
4 some similar features were ponds. You know,
5 and certainly they're both nice, wooded areas.
6 That's about the extent I recall. It was a
7 little while back since I've been there.

8 Q. So that's the extent of your knowledge of the
9 difference between the two?

10 A. I would say that's a fair characterization.

11 Q. Do you think that a typical user of the Audubon
12 Wildlife Sanctuary would be similar to a
13 typical user of the state park in Pillsbury?

14 A. Again, I didn't look at specific differences
15 between visitors for the study, so I wouldn't
16 be able to comment on that.

17 Q. Did you -- are you aware of the fact that there
18 is a New Hampshire motocross track in the town
19 of Lempster?

20 A. I was not aware of that.

21 Q. So you aren't aware that it's a large tourist
22 attraction in Lempster?

23 A. I was not aware of that.

24 Q. You aren't aware that they do races Fridays --

1 or two races every week?

2 A. Again, I mean, I don't know what else to add,
3 other than I'm not familiar with that.

4 Q. Would it surprise you if that particular
5 attraction would cause traffic to go through
6 the town of Lempster?

7 A. Again, I'm sorry. I mean, I didn't look at
8 this as a specific issue, so I really can't add
9 much more.

10 Q. Well, you've included this in your report, so
11 I'm just going to ask you. Would it surprise
12 you if that attraction contributed to the
13 traffic in the town of Lempster?

14 A. I think that, in general, any feature of a town
15 that's unique to it could be a tourism
16 transaction, such as that.

17 Q. And the same with the meals and rooms sales?

18 A. Meals and rooms tax would be an indicator of
19 overall visits to a region. It's a standard
20 economic measure.

21 Q. Is that a "yes" then?

22 A. A "yes" to what?

23 Q. That the motocross track might have an impact
24 on the meals and rooms sales?

1 A. So if you're saying that the motocross is a
2 tourism activity in that area, it would
3 certainly contribute towards meals and rooms
4 tax.

5 Q. Okay. And also contribute towards the growth
6 and tourism-related employment?

7 (Court Reporter interrupts.)

8 A. The study that looked at it didn't say anything
9 about growth. It said the introduction of the
10 Project had little or no impact on meals and
11 rooms tax, meaning that -- so they're not
12 implying any growth associated with it.

13 Q. I'm just looking at the second item on Page 8
14 that talks about since it began operating,
15 growth and tourism-related employment has been
16 as large or larger.

17 A. Sure. That's consistent with that finding.

18 Q. So, do you think the motocross track could
19 contribute to that as well?

20 A. I'm sorry. I mean, I did not specifically look
21 at the motocross track, so I don't know how it
22 impacts or not the region.

23 MR. RICHARDSON: Yeah, I'm thinking
24 we're -- I mean, we're assuming these facts

1 that Attorney Maloney is suggesting are true,
2 but there's nothing in the record to state
3 whether or not this track was increasing in
4 revenue or decreasing. And the witness says he
5 didn't even know it was --

6 MS. MALONEY: I'm going to object.
7 This is not --

8 (Court Reporter interrupts.)

9 PRESIDING OFFICER SCOTT: One at a
10 time, please.

11 MS. MALONEY: And it's a speaking
12 objection, and it's coaching.

13 MR. RICHARDSON: No, no. I'm
14 actually not. I'm actually trying to get to
15 what I feel the concern here is, is that the
16 witness doesn't have any knowledge of what's
17 happening there. And it's -- you know, it's
18 not probative as a result.

19 MS. MALONEY: Well, I would totally
20 disagree. And I think the fact that the
21 witness doesn't have knowledge of it is
22 actually very relevant and material to the
23 discussion.

24 PRESIDING OFFICER SCOTT: Well, I

1 think the witness has answered the question,
2 that he doesn't know; right?

3 Is that correct?

4 WITNESS MAGNUSSON: That's correct.

5 MS. MALONEY: And that's my point.

6 And I have nothing further.

7 PRESIDING OFFICER SCOTT: Okay. So,
8 Committee members, Subcommittee members, any
9 questions? Mr. Boisvert.

10 QUESTIONS BY DR. BOISVERT:

11 Q. Regarding the tourism study for Lempster, who
12 carried out this study, and who authorized it
13 and paid for it?

14 A. The study was performed by Brian Gottlob of
15 PolEcon Research in December 2013. And my
16 understanding is that this study was actually
17 presented to the -- in an SEC hearing related
18 to Iberdrola's proposal for a wind farm in the
19 Grafton County region.

20 Q. But who paid for it?

21 A. I would assume that it was -- well, let me...
22 sorry. Let me not assume. Let's see if...

23 (Witness reviews document.)

24 A. In the study, I don't see where it -- oh,

1 actually, here it is. "Iberdrola Renewables,
2 LLC commissioned PolEcon to review prior
3 studies of wind farm impacts on tourism and
4 examine publicly available, objective, economic
5 and other data for regions in New Hampshire
6 where wind farms are currently operating."

7 Q. So it was authorized and paid for by a company
8 that builds wind farms.

9 A. That's correct.

10 Q. Okay. Could you -- I believe I understood what
11 the methodology was behind this report, but
12 could you briefly summarize it again for me?

13 A. The tourism report?

14 Q. Yes.

15 A. Well, so the purpose was to look at several
16 different data sources for that study. And so
17 what they did was they reviewed information --
18 and this is a common approach, which is one of
19 the reasons I was comfortable with its
20 findings -- looking at meals and rooms tax.
21 That's something that, if I was to have done a
22 similar study, I would have done. Also to look
23 at revenues at the Pillsbury State Park.
24 That's public information. That is a data

1 source that the author looked at. Weekend
2 traffic volume, that's also publicly available
3 data. That's another resource that was looked
4 at. So, basically the study looked at publicly
5 available data sources to see if there was any
6 indication that there had been a change in
7 tourism. And the measures that they use are
8 standard measures that would be used in a
9 tourism-related study.

10 Q. You say "change in tourism." Over what span of
11 time are we talking about?

12 (Witness reviews document.)

13 A. The time period was before and after the
14 construction. I'd have to go through and look
15 for the time period for each one. But just for
16 an example, for rooms and meals change, they
17 looked between 2007 and 2012.

18 Q. So, a five- or six-year span.

19 A. That's correct.

20 Q. Are you aware of other tourism studies that
21 have been conducted in New Hampshire in this
22 approximate span of time?

23 A. This is the only one that I'm aware of.

24 Q. So we don't have much to compare it against for

1 another study, for a study that would be in an
2 area that was not involved with wind farms.

3 A. I mean, there have been other studies that have
4 looked at tourism. But as far as for
5 specifically for New Hampshire, this is the
6 only one that was done. I will say that I
7 think the methodology done for it is solid, and
8 it does -- it looks at standard measures that
9 really any tourism-related economic study would
10 look at. So, I mean, another study would be
11 redundant 'cause it would look at similar-type
12 metrics.

13 Q. Hypothetically, tourism might have skyrocketed
14 in several other areas in the state but remain
15 more or less level in Lempster, which would
16 suggest hypothetically that there was a
17 relationship with a wind farm; or conversely,
18 it could have gone down elsewhere. So, a
19 single study lacks some comparability, and I'm
20 not entirely persuaded. Thank you.

21 PRESIDING OFFICER SCOTT: Commissioner
22 Rose, please.

23 CMSR. ROSE: Thank you.

24 QUESTIONS BY CMSR. ROSE:

1 Q. And I had a similar question as Dr. Boisvert
2 with regards to the duration of time. And I
3 appreciate that perspective as it pertained to
4 rooms and meals over I think you said was a
5 six-year window of time that that study that
6 you were referencing took into consideration.
7 I was wondering if you could provide that same
8 duration of time, or if it was the same
9 duration of time, as it pertained to the
10 traffic counts that you referenced, employment
11 counts and the revenues to the state park.

12 A. Okay. So, actually, to just clarify on the
13 previous question on tourism, this did
14 benchmark against all counties in the state and
15 the state level. So it didn't just look at the
16 Lempster region in isolation. It was a
17 comprehensive look at all of New Hampshire and
18 its tourism over that time period. And it
19 would also appear that, for the different time
20 periods -- or the employment that was over a
21 similar time period of 2007 to 2012, the state
22 park's data was over a similar time period of
23 2007; so, for the state parks revenue since
24 2007. And another one was based on a visitor

1 survey study that was done in 2009 by Plymouth
2 State University. So this study does rely on
3 other resources to reach its conclusions.

4 Q. You state in your prefiled testimony that the
5 purpose of your testimony was to speak upon the
6 impact of the project, or anticipated impact to
7 the region's economy. Could you speak to how
8 you went about considering the recreational
9 opportunities in terms of that region's
10 economy?

11 A. Again, really, this study that was done on
12 tourism is related to, you know, outdoor
13 recreation opportunities is what that analysis
14 was based on. In this study I did not conduct
15 any firsthand research on recreation or
16 tourism. It was based on the finding from this
17 other study.

18 Q. So in your study that you referenced, you did
19 not reach out to anybody in the tourism-related
20 industry within that region that's going to be
21 within the area of the Project.

22 A. I did not speak with anyone from the tourism
23 industry, no.

24 Q. As it pertains to the value of homes or impact

1 on properties, you referenced that you do not
2 believe that there's a correlation between the
3 value of a home or what a home sells for based
4 on its proximity to the wind towers; is that
5 correct?

6 A. I wouldn't say it was my belief. I would say
7 that's based on the evidence that was collected
8 and analyzed. It demonstrated there wasn't a
9 relationship between the distance of a property
10 and its sales price.

11 Q. So, based on your analysis of the studies that
12 you have read, it is your expert opinion that
13 there is not a correlation between those two
14 factors.

15 A. That's correct.

16 Q. Did your -- in your expert opinion, is there a
17 correlation associated with the duration of
18 time that a home might be on market prior to
19 sale?

20 A. For this study, the data wasn't available, as
21 far as time on market. It just wasn't in the
22 type of available -- that was available. How
23 it's factored into the analysis -- and this is
24 discussed in the original report -- is that if

1 a house sits for a prolonged period of time in
2 a region, or you have multiple houses in a
3 region for a prolong period of time selling,
4 based on just laws of supply and demand, you
5 should -- at some point some people would have
6 to sell, and that would lead to a depression in
7 sales price. That didn't -- that has not been
8 observed, so that does not indicate that time
9 on market was a factor.

10 Q. And in your analysis, there are several
11 references to the Wild Meadow Wind Project, and
12 I just wanted to make sure you're aware that
13 that project did not move forward.

14 A. I was aware of that.

15 Q. Okay.

16 CMSR. ROSE: Thank you.

17 PRESIDING OFFICER SCOTT: Mr.
18 Clifford.

19 QUESTIONS BY MR. CLIFFORD:

20 Q. Good afternoon. I just have a few questions.
21 I'm on Page 8 of your testimony. You
22 referenced that you reviewed some 20 other
23 studies, and I was just wondering if you happen
24 to recall where those studies took place and

1 how you reached the conclusion that the
2 underlying real estate values were --

3 (Court Reporter interrupts.)

4 Q. I'll restate. If you can just inform me, what
5 were the names of those 20 studies, or where
6 did they take place? And can you confirm which
7 ones -- can you confirm the observation that
8 you took in Lempster, that there was no
9 correlation between impact on -- negative
10 impacts on property valuations as a result of
11 proximity to wind turbines?

12 A. Sure. So, in the original study it looked at
13 quite a few different studies. And then in
14 the -- and that was in 2012. And then in the
15 2014 update, it looked at any additional
16 studies that had been done that basically
17 helped inform if there might be anything that
18 might change the original finding.

19 So I'll start off with the kind of newer
20 ones 'cause I think they're especially
21 relevant. One that was reviewed that I think
22 is probably one of the most recent, but also
23 one of the most relevant to New Hampshire, is
24 there was one that considered the relationship

1 between -- or titled "Relationship Between Wind
2 Turbines and Residential Property Values in
3 Massachusetts." This was performed in 2014.
4 And take a second to...

5 (Witness reviews document.)

6 A. This one was significant, in that it looked at
7 almost 122,000 residential property
8 transactions located within 5 miles of a
9 turbine between 1998 and 2012 in Massachusetts.
10 The study examined communities over a wide
11 range of land use and zoning types and spanned
12 from rural to urban. There were 121
13 transactions that were less than a quarter-mile
14 from a turbine location, 986 that were between
15 a quarter and half-mile from a turbine
16 location, and just over 6,000 that were between
17 a half-mile and a mile from a turbine location.
18 The study concluded that there was no support
19 for the claim that wind turbines affected
20 nearby home prices and that no evidence emerged
21 as a post-construction impact. That, I think,
22 is -- that one is one of the most comprehensive
23 and one of the most recent, so I think that
24 definitely informs us.

1 Some of the other ones that have been
2 looked at -- I can retrieve all 20, but just as
3 an example, some other ones in 2013, Lawrence
4 Berkeley National Laboratory did one that
5 looked at 50,000 properties and concluded that
6 there was no statistical evidence of -- well,
7 they specifically -- the 2013 study reported no
8 statistically significant difference in the
9 sales price for transactions at any distance,
10 including within bands of .5 miles and 1 mile
11 of a wind turbine. The study provides strong
12 statistical evidence that there's no
13 relationship between residential property
14 values and commercial wind tower projects.

15 Another one that was considered was in
16 2009. That looked at 7500 single-family homes
17 across the entire United States. And again,
18 that one... I'm just trying to pull up points
19 that are relevant.

20 (Witness reviews document.)

21 A. Again, their primary finding after looking at
22 7500 single-family homes across nine U.S.
23 states was no statistically significant
24 difference in selling prices between homes with

1 minor, moderate, substantial or extreme views
2 of wind turbines. Would it be helpful if I
3 went through any more or --

4 Q. No. Thank you. I was just trying to get a
5 sense of what you were referring to when you
6 said you --

7 A. Oh, okay.

8 Q. -- and what study you actually looked at so we
9 can -- or I can more be informed myself.

10 A. Okay.

11 Q. My other question was, there was -- I thought I
12 heard conflicting discussions here this
13 afternoon or this morning. Was the Lempster
14 study based on actual sales or assessed value?
15 Because I heard two different versions being
16 bandied about this morning and --

17 A. Yeah. Sorry if I wasn't clear. Both were
18 looked at, both assessed value and actual
19 value. So, some of the steps that were taken
20 was, one, to look at whether assessed values
21 were different if they were close to a wind
22 turbine versus further away, to try and see if
23 there was some type of impact; there was not.
24 Another piece was then to look at and see,

1 well, overall, in general, do homes tend to
2 sell at their assessed value, because that
3 would be an important value, and they do. In
4 fact, it's a very good predictor of -- the
5 assessed value is an excellent predictor of
6 what a house sells for. It's not always -- you
7 know, it doesn't always exactly do it, but
8 overall, on average, it is a very good
9 indicator.

10 So, then the final piece was to again look
11 at whether homes that -- two pieces -- whether
12 homes -- so we know if a, from looking at this,
13 whether a home is located nearby or further
14 away from a wind turbine, their assessed values
15 on average were about the same. We also know
16 that from looking at the New Hampshire study
17 and these other ones that -- or actually,
18 specifically an assessed value in New
19 Hampshire, that if they have a view of a wind
20 turbine or not, it didn't impact assessed
21 value.

22 So the last piece was to look at and see
23 if houses that sold near a wind turbine, or
24 that had a significant view or had a view of a

1 wind turbine, if they sold for less than what
2 their assessed value was. And that wasn't the
3 case. So, basically, by looking at these
4 different pieces of evidence, it shows that
5 assessed values don't change in the region
6 because of wind turbines either related to view
7 or distance to wind turbine; that assessed
8 value is a good indicator of what they should
9 sell at, and that there was no difference
10 between homes that were near a wind turbine or
11 further away, or homes that had a view of a
12 wind turbine or didn't, whether they sold for a
13 different price than what we would have
14 expected from their assessed value.

15 Q. And then would you agree that the actual sales
16 data is a better indicator of the correlation
17 or a stronger indicator of the correlation than
18 just purely measuring against assessed value?

19 A. No, because you have to have some type of basis
20 for comparison. And so -- I'm sorry if I'm not
21 explaining it well. But assessed value -- and
22 this is if you look across the board --
23 assessed value is an excellent predictor of
24 what a house actually sells for. And so if

1 that -- if the sales price for homes in a
2 certain area -- so, if you were to look at all
3 the houses that are nearby a wind turbine -- if
4 there was an impact, those sales prices should
5 be lower than their assessed value, since we
6 know overall assessed values are a good
7 indicator of what the sales price should be.
8 That did not occur. So, that is strong
9 evidence that the presence of a wind turbine
10 did not have an impact on the sales price.

11 Q. Okay. Thank you.

12 QUESTIONS BY PRESIDING OFFICER SCOTT:

13 Q. Why don't we stay on that same topic.

14 So, Ms. Linowes showed you some
15 documentation regarding assessments in
16 Lempster. Do you know the timing on that?
17 Your report -- and correct me if I'm wrong --
18 you just articulated that you really take that
19 assessment as a baseline. But my concern is if
20 the assessment reflects a lower value as those
21 documents that you saw based on an assessor
22 saying I'm going to discount the assessment
23 because of the wind farm, that kind of calls
24 into question -- you know, we have "a chicken

1 and an egg" thing, right, of what caused what.
2 So, do you know the timing of your report
3 compared to the timing of those assessment
4 changes?

5 A. So, in the 2012 report, both -- well, it looks
6 like the other assessed value occurred more
7 recently, in 2016. But the second one that was
8 mentioned with Onnela, that was actually
9 recorded in the report. I think there's... no,
10 actually, let's see.

11 (Witness reviews document.)

12 A. No. Actually, both of those are reflected in
13 the 2012 report. Yeah, so both those
14 complaints were highlighted. And the thing --
15 so, both of those occurred in... one was in
16 May 2009 and another one was in June 2010. And
17 overall, assessors do a good job of predicting
18 the values based on what was observed. That
19 doesn't mean for every property they get it
20 right. On these, these are two examples out of
21 many transactions that have occurred where an
22 assessor gave their opinion that it should be
23 reduced and the town granted that. These are
24 actually outliers, though, because based on

1 what I said before, we specifically looked for
2 this, and what would happen is if -- because,
3 you know, we have now a good history of
4 assessed values around wind turbines. If they
5 were down 5 to 10 percent across the board
6 around those, that would have been reflected.
7 That would have been picked up. That didn't
8 occur. So what that means is these are two
9 unusual, you know, circumstances. They're
10 outliers. They're not what overall assessors
11 are doing with property. In fact, these are
12 the only two incidents I've heard of out of all
13 the entire time period where that's been done.

14 Q. And having -- let's assume these are outliers.
15 Would these two assessments that have gone
16 down, apparently have gone down because of the
17 wind farm in Lempster, does that change in any
18 way your view on the impact on abutting
19 properties or close-in properties?

20 A. It does not, and specifically because it hasn't
21 turned into a widespread phenomenon. For
22 example, where you had hundreds of assessment
23 requests that were granted, then that certainly
24 would have an impact. But these are two ones

1 that are now almost six years old that were
2 granted. And there's a long history of
3 significant -- or several projects that have
4 come online since then and that hasn't been the
5 case.

6 Q. Thank you for that.

7 The Lempster study, how many properties --
8 just looking for a sample size and order of
9 magnitude.

10 A. Sure.

11 Q. How many properties were sold during that
12 period?

13 (Witness reviews document.)

14 A. So, the time period was between, that we looked
15 at, was between 2005 and 2011. Total number of
16 sales looked at for that time period was 2,593.
17 The number of post-construction sales in the
18 Lempster region that was looked at -- so,
19 basically, it would have been after the
20 turbines were in place up to 2011 -- was 88
21 total, with 16 in Lempster. So it's -- for the
22 region it was, you know, in line with
23 historical sales volume. It certainly is a
24 lower number, but that was one of the reasons

1 that other studies were looked at in addition.
2 This is one piece of evidence that confirms
3 what other studies are finding that have taken
4 into account larger property sales volumes.

5 Q. Okay. Thank you.

6 On the economic impact analysis, the
7 number of FTEs, whether it's after the project
8 or stemming from ultimately the project, there
9 was no assumption made, I assume, on where the
10 actual employees came from originally, right,
11 whether they were hired locally or they came
12 into the community? Is that a correct
13 statement?

14 A. That's correct.

15 Q. Okay. That's all I have.

16 Did you have something, Dr. Boisvert?

17 DR. BOISVERT: You covered it.

18 PRESIDING OFFICER SCOTT: Ms.

19 Weathersby.

20 MS. WEATHERSBY: Thank you.

21 QUESTIONS BY MS. WEATHERSBY:

22 Q. Do you know at the time of the Lempster study
23 concerning the assessed values, before and
24 after, what the equalization ratio was in the

1 town?

2 A. I don't specifically recall what the
3 equalization ratio was, no.

4 Q. But you're familiar with the concept that there
5 is a ratio in place that determines the
6 relationship between the assessed value and the
7 market value.

8 A. I am. And that was -- when actually conducting
9 the study, I spent quite a bit of time looking
10 for -- because it wasn't just Lempster. It was
11 every town in Sullivan County, and that is a
12 factor I took into account.

13 Q. Wouldn't that be a pretty important factor to
14 determine whether or not assessed values really
15 are pretty much equal to the market value as
16 you suggested?

17 A. It is, and that is part of what was done.

18 Q. Second question. In other matters that have
19 come before the SEC not concerning wind
20 turbines, we've heard expert testimony from
21 economic experts concerning market value
22 effects of other types of towers. And just to
23 paraphrase, the findings have been similar.
24 The opinions have been similar to yours, in

1 that there's generally no widespread market
2 effect of the property, but that for properties
3 in which proximity to a tower is close and
4 there's a direct view of the tower, that those
5 properties are fairly likely to have some sort
6 of market effect of their property, a negative
7 market value effect. Would you agree or
8 disagree with that opinion?

9 A. As far as -- could you clarify a little bit?

10 Q. Yes. Would you disagree or disagree with that
11 opinion, as far as it would concern wind
12 turbines?

13 A. Sure. I mean, that's really at the heart of
14 what was looked at here. And I mean, based on
15 what was looked at in Lempster, plus the other
16 studies, the conclusion is that it does not
17 have -- proximity to a wind turbine does not
18 have an impact on sales price.

19 Q. But the proximity in connection with having a
20 direct view would.

21 A. No. View has been looked at extensively also.
22 The Lempster study that I performed looked at
23 that specifically. And many other studies have
24 as well. They specifically looked at -- in

1 fact, the one I cited looked at -- related to
2 Lawrence Berkeley even characterized views from
3 "mild" to "extreme," and again, even across
4 that kind of spectrum of views did not find an
5 impact, you know --

6 Q. So it's your opinion, not saying in the present
7 case, but if a tower was -- or if a wind tower
8 was close to a home, and that home had a direct
9 view of the tower, that that wouldn't affect
10 its property value -- market value?

11 A. Yeah. Based on the research I've conducted, it
12 would be highly unlikely that a view of a
13 turbine would have an impact on property value.

14 MS. WEATHERSBY: Thank you.

15 PRESIDING OFFICER SCOTT: Mr.
16 Iacopino.

17 MR. IACOPINO: I have one, actually
18 two questions.

19 DR. WARD: Can't hear you.

20 MR. IACOPINO: I have two questions
21 and then just one housekeeping thing.

22 QUESTIONS BY ATTY. IACOPINO:

23 Q. The appraisal -- the abatement that you
24 referenced before, Mr. Onnela, do you know if

1 that's the same Kevin Onnela who testified in
2 public comment at this particular proceeding in
3 February of 2016 from Lempster, New Hampshire?

4 A. I do not.

5 Q. Okay. All right. Housekeeping-wise, both of
6 your reports say that they're updates of prior
7 reports; is that correct?

8 A. That's correct.

9 Q. All right. At least what we've received, we
10 only have the updates. And my question -- and
11 I don't know if counsel wants to answer this or
12 if you want to answer this, but -- well, first
13 of all, let me ask you. Is it necessary to
14 have and to read your updates in conjunction
15 with the prior existing reports?

16 A. I think the prior reports would be helpful, in
17 that they give some additional context and
18 background. The updates kind of focus on the
19 process that was done to review those studies
20 and anything that would have been noteworthy, a
21 change in opinion. So I certainly think the
22 original ones could be helpful.

23 MR. IACOPINO: So, Mr. Needleman, let
24 me turn to you at this point. I'm not sure

1 that those prior reports are in our record
2 here. Is it your intention to offer them?

3 MR. NEEDLEMAN: Given the testimony
4 we heard, we can do that, yes.

5 MR. IACOPINO: Well, I'm not trying
6 to change your tactics or anything. I'm just
7 trying to make sure if we're supposed to be
8 relying on that, that they get in the record.

9 MR. NEEDLEMAN: No, no. I appreciate
10 the comment. It's not a tactical decision for
11 me. Having heard what Mr. Magnusson just said,
12 it sounds like it could be helpful for the
13 Committee. And so we're happy to include it,
14 so we'll do that.

15 MR. IACOPINO: So at some point
16 you'll have them marked and present them.

17 MR. NEEDLEMAN: Yes.

18 MR. IACOPINO: I think that's it.
19 Thank you.

20 PRESIDING OFFICER SCOTT: Mr.
21 Needleman, do you have any redirect?

22 MR. NEEDLEMAN: I don't. Thank you.

23 PRESIDING OFFICER SCOTT: Correct me
24 if I'm wrong, your next panelist is Mr. O'Neal;

1 is that correct?

2 MR. NEEDLEMAN: That's correct.

3 PRESIDING OFFICER SCOTT: So, Mr.
4 Magnusson, you're free to go.

5 (Witness is excused.)

6 PRESIDING OFFICER SCOTT: And
7 what's -- okay. Let's go off the record while
8 we get people in place.

9 (Pause in proceedings)

10 PRESIDING OFFICER SCOTT: Okay.
11 We're back on the record. Mr. Needleman.

12 MR. NEEDLEMAN: Thank you.

13 (WHEREUPON, ROBERT O'NEAL was duly sworn
14 and cautioned by the Court Reporter.)

15 DIRECT EXAMINATION

16 BY MR. NEEDLEMAN:

17 Q. Please state your name for the record.

18 A. My name is Robert O'Neal.

19 Q. And where do you work?

20 A. I work at Epsilon Associates.

21 Q. And could you briefly summarize the purpose of
22 your testimony.

23 A. Sure. The purpose of my testimony is to give
24 testimony about sound levels and shadow flicker

1 from the Antrim Wind Project.

2 Q. And you have three exhibits in front of you:
3 Applicant's Exhibits 6, 13 and 21. Applicant
4 Exhibit 6 is the original testimony that you
5 filed when the Application was filed; Applicant
6 13 is testimony that was supplemental when the
7 rules were updated and the Applicant was
8 required to file more information, and then
9 Applicant's 21 is your August 15 supplemental
10 testimony; is that correct?

11 (Witness reviews documents.)

12 A. That's correct.

13 Q. Do you have any changes that you need to make
14 today to any of that testimony?

15 A. I just have one very minor typographical
16 change --

17 Q. Okay. Could you --

18 A. -- in the February 19th, 2016 testimony.

19 Q. What is the exhibit number?

20 A. It says Attachment 10.

21 DR. WARD: Could I just request that
22 the witness move over to the other seat so I
23 don't have to look through Mr. Needleman's
24 head?

1 PRESIDING OFFICER SCOTT: Would that
2 be all right with you, Mr. O'Neal?

3 THE WITNESS: I'm sorry?

4 PRESIDING OFFICER SCOTT: There's
5 been a request for you to move over one seat so
6 they can see you as you talk.

7 WITNESS O'NEAL: I'm flattered, and
8 there's no problem.

9 DR. WARD: Thank you, Mr. Chairman.

10 PRESIDING OFFICER SCOTT: Thank you,
11 Mr. O'Neal.

12 BY MR. NEEDLEMAN:

13 Q. So, with respect to Applicant's 13, can you
14 tell us the page and line number where you have
15 the change?

16 A. Yes. On Page 4, Line 7, there's one minor
17 typographical error. "Logged every 10 minutes"
18 should be "logged every 60 minutes." That's
19 it.

20 Q. Other than that, any other changes?

21 A. No, there are not.

22 Q. Okay. So, including that one change, you then
23 adopt all of that testimony and swear to it?

24 A. Yes, I do.

1 Q. Thank you.

2 MR. NEEDLEMAN: All set, Mr.
3 Chairman.

4 PRESIDING OFFICER SCOTT: Just to
5 clarify, that change is on Line 7; is that
6 correct?

7 THE WITNESS: Line 7, Page 4.

8 PRESIDING OFFICER SCOTT: Thank you.
9 Okay, Mr. Richardson.

10 MR. RICHARDSON: Thank you, Mr.
11 Chairman.

12 CROSS-EXAMINATION

13 BY MR. RICHARDSON:

14 Q. Mr. O'Neal, what's your experience in the areas
15 of post-construction sound monitoring for wind
16 projects?

17 A. Quite extensive. I have measured sound levels
18 at many, many wind farm projects after they're
19 operating.

20 Q. What projects in New England or in New
21 Hampshire, by way of example?

22 A. For example, we are responsible for the Groton,
23 New Hampshire post-construction sound-level
24 monitoring program. I've done other

1 post-construction monitoring programs in other
2 states in the country as well, Michigan and
3 Illinois, for example.

4 Q. How many projects have you had experience with
5 in that, comparing the post-construction sound
6 results with the predicted model?

7 A. Sure. In terms of actual operating wind
8 projects, I would suggest maybe six to eight.
9 In addition to that, we also did a research
10 study where we also measured some other ones.

11 Q. And how do predicted sound levels compare with
12 those actually measured post-construction?

13 A. They compare quite well. They do. With the
14 right assumptions, which we make, the model
15 sound levels tend to be a little conservative;
16 in other words, we get answers that are
17 slightly higher than what we actually measure.

18 Q. Okay. And so what -- how conservative are
19 they? What's the relationship? I mean, are we
20 seeing a difference of one decibel better, or
21 how much better?

22 A. Sure. So, generally, anywhere from 1 to
23 3 decibels higher. The model number -- to be
24 clear, the model numbers are typically 1 to

1 3 decibels higher than what we actually
2 measure.

3 Q. And would you expect the Antrim Wind Project to
4 similarly perform better than what the models
5 predict?

6 A. I would.

7 Q. What would happen if the Antrim Wind Energy
8 Project doesn't meet its predictions or exceeds
9 the limits that are required by the SEC rules?

10 A. I guess, first of all, I don't expect that to
11 happen. The highest predicted sound level
12 anywhere in the Project is only 38 decibels.
13 This is a project with a very large setback
14 from any residence, and that's reflected in the
15 sound levels. So, for example, that highest
16 receptor of 38 is still several decibels below
17 the nighttime standard of 40.

18 Q. And we just heard, actually moments ago,
19 reference to Lempster and the potential impact
20 on property values. Are you familiar with that
21 project at all?

22 A. I'm a little bit familiar with it.

23 Q. So would it surprise you that those properties
24 were on the order of 500 to 600 feet from the

1 turbines?

2 A. I can't speak with confidence how far away some
3 of the properties are. I'm just not familiar
4 with those distances.

5 Q. Okay. But do you -- let's accept that, subject
6 to check, that that was the distance. How does
7 that compare to the Antrim distances?

8 A. So, if there are properties in Lempster that
9 are, say, 500 to 700 feet away from turbine,
10 subject to check, that's much, much closer than
11 anything we have here in Antrim. As I said --

12 MS. LINOWES: Mr. Chairman, I'm going
13 to object to this question. The turbines being
14 used in Lempster are not comparable to the
15 turbines that are proposed in Antrim. It's a
16 very different scenario, the way the landscape
17 is. So, to state that the 500 to 600 feet is
18 relevant in this context, I think that's
19 inaccurate.

20 MR. RICHARDSON: Ms. Linowes will
21 have an opportunity to ask questions of this
22 witness.

23 PRESIDING OFFICER SCOTT: Yeah. Is
24 your microphone on?

1 MR. RICHARDSON: Mine? I'm sorry.

2 Yes, it is.

3 PRESIDING OFFICER SCOTT: Okay. Go
4 ahead.

5 BY MR. RICHARDSON:

6 Q. So, I guess the question, then, subject to
7 those reservations, if Antrim Wind was unable
8 to meet its noise requirements, what's the
9 remedy, or what's Antrim Wind proposing to do
10 if that happens?

11 A. So, hypothetically speaking, if for some reason
12 they were not able to meet them --

13 Q. Yes.

14 A. -- there are noise reduction options that wind
15 turbine manufacturers have that could come into
16 play to reduce sound levels.

17 Q. But would Antrim Wind continue to operate if it
18 were not meeting the predicted sound levels, or
19 the required sound levels, I should say?

20 A. Well, the SEC rules are pretty clear that
21 post-construction compliance testing is going
22 to be required of the wind turbines. I don't
23 know how the rules are going to play out, if
24 approval were given for this project, how it

1 will be written in terms of demonstrating
2 compliance versus continuing to operate. I'm
3 not able to comment on that.

4 Q. Well, so what I'm trying to get at is Antrim
5 Wind, I believe in your testimony you said will
6 meet the SEC requirements. And my
7 understanding is that if you don't, that means
8 the Project will have to fix the problem, and
9 it won't operate until it does. Is that your
10 returning?

11 A. It will absolutely have to fix the problem.
12 That's correct. I don't know if they'll
13 completely shut down in the interim or if
14 they'll be working with the town or the New
15 Hampshire SEC. I can't speak to those kinds of
16 details.

17 Q. So, then let me ask you this: What's the
18 likelihood, in your view, of such an exceedance
19 occurring?

20 A. Well, as I said, I think that's not likely to
21 happen at all. The modeling is conservative.
22 We are several decibels under the standard to
23 begin with. And there's several conservative
24 assumptions that we use in the modeling that

1 we've done according to the rules. And our
2 experience in the past has shown that to be
3 true. Those model results do hold. So we're
4 confident of them.

5 Q. Thank you.

6 PRESIDING OFFICER SCOTT: Mr. Enman.

7 MR. ENMAN: Thank you, Mr. Chairman.

8 CROSS-EXAMINATION

9 BY MR. ENMAN:

10 Q. Just a couple of questions. I was in Lempster
11 on Saturday morning, and there was significant
12 shadow flicker. Lower sun angles, morning.
13 And I'm just curious, because I've been up
14 there on several occasions to look at this
15 exactly. Is there a correlation of distance or
16 a diminishing distance from the turbines and
17 shadow flicker? And also, the second part
18 would be for sound also. The farther you are
19 away, the less likely the impact? When I'm
20 close to the turbines near the ground, I can
21 see shadow flicker. Close to the turbines, I
22 mean, I'm literally under 50 feet away, and
23 obviously there's a large blade right there.
24 When I look in the distance, I can't see it on

1 a far tree line. And I'm just curious. Is
2 there some sort of -- is it a mathematical
3 factor, or is there just a correlation that the
4 farther away you are, it just goes away?

5 A. That's true for both sound and shadow flicker,
6 certainly. For sound, obviously, distance is
7 your friend. It's a physical fact, that as you
8 get further away from a turbine it's going to
9 get quieter. And that's just one of the
10 factors that goes into the propagation model
11 that's in our report as part of the
12 Application. So as you move further away, yes,
13 it gets quieter.

14 And the same is true with shadow flicker.
15 You know, obviously if you're standing right at
16 the base of a turbine and the sun is -- it's
17 all geometry, of course. If the sun's at the
18 right angle, you're going to see a fairly sharp
19 shadow, just as you would see your own shadow
20 at that time. As the sun gets lower and lower
21 in the sky, the shadows start to get very much
22 more diffuse as you go further away from them
23 because of the optical characteristics of the
24 atmosphere.

1 Q. So is there -- so, okay. So it would literally
2 be geometrical geometry for determining how far
3 that flicker would actually be discernible?

4 A. Right. And the literature is -- there's no
5 bright line, if you will, that says, you know,
6 at 400 feet it just magically disappears. It
7 just gradually fades away. Certainly in our
8 experience, you know, if you're out -- if
9 you're looking at the SEC rules which asked you
10 to analyze out to a mile, we certainly haven't
11 seen anything out to a mile before. It's
12 diffuse enough at that point, you don't
13 recognize it.

14 MR. ENMAN: Thank you.

15 PRESIDING OFFICER SCOTT: Harris
16 Center?

17 MR. FROLING: No questions.

18 PRESIDING OFFICER SCOTT: I think
19 we're back to Ms. Berwick.

20 CROSS-EXAMINATION

21 BY MS. BERWICK:

22 Q. Mr. O'Neal, in your 2011 flicker study, in
23 Figure 4.2, the shadow flicker and technical
24 memorandum -- and this is located at the end of

1 the sound-level assessment report, Page 7, I
2 read that the expected potential shadow hours
3 per year at our residence -- and we are listed
4 in that report as No. 58 and 59 -- I read that
5 our shadow hours are 9 hours and 17 minutes; is
6 that correct?

7 A. I don't have the 2011 report in front of me.

8 Q. I did submit it as --

9 A. I can't answer that.

10 Q. I did submit it online and flash drive --

11 MR. IACOPINO: Do you have a copy to
12 show him?

13 MS. BERWICK: Yes.

14 MR. NEEDLEMAN: What exhibit number
15 is it?

16 PRESIDING OFFICER SCOTT: It's one of
17 your exhibits; correct?

18 MS. BERWICK: It's the 2011
19 sound-level assessment report. But the back of
20 it is the flicker study.

21 PRESIDING OFFICER SCOTT: Right. But
22 you did submit it you said.

23 MS. BERWICK: I did submit it --

24 PRESIDING OFFICER SCOTT: All right.

1 MS. BERWICK: -- because I wanted it
2 to be -- I didn't know I had to bring it today,
3 because I submitted it on the --

4 PRESIDING OFFICER SCOTT: Okay. So
5 let's get that identified. So we'll figure out
6 which exhibit -- I'm going to assume it's one
7 of your exhibits. And they're not titled,
8 so --

9 MR. IACOPINO: I have an exhibit
10 list. Do you know what exhibit number we gave
11 that?

12 MS. BERWICK: No, but --

13 MS. MALONEY: It's 5, I think.

14 MS. BERWICK: Thank you. You got it?
15 Thank you.

16 MR. IACOPINO: Yes, it's Abutter 5.

17 PRESIDING OFFICER SCOTT: Thank you.
18 Go ahead.

19 BY MS. BERWICK:

20 Q. Okay. So, in Figure 4.2 on Page 7 -- and this
21 is at the end of your sound level and flicker
22 level -- could you read me the expected
23 potential shadow hours per year for -- we are
24 58 and 59. If you want to confirm that --

1 A. I'm sorry. Did you say you're on Page 7 of the
2 shadow flicker report?

3 Q. It's the addendum at the end. There's a --

4 A. I guess -- we did not do this. We did not do
5 this report. Our firm did not conduct this
6 study. This was conducted by Saratoga
7 Associates.

8 The 2011 report, if you look at the footer
9 at the bottom, it says "Saratoga Associates."

10 Q. I'm sorry. It does say Saratoga Associates.
11 So, who is it that is going to -- you had
12 nothing to do with this shadow flicker analysis
13 from 2011?

14 A. That's correct. We did the present-day
15 analysis, but not the 2011 study.

16 Q. Okay. Well, in the 2011 study, do you see
17 where it says that for No. 58, that we would
18 have 9 hours and 17 minutes of shadow flicker?

19 A. I see that, yes.

20 Q. Okay. Can you, using your current report, tell
21 me what the expected hours of flicker at our
22 residence is? I can tell you what I found. It
23 was 8 hours and 21 minutes.

24 A. I don't think I can do that. And the reason I

1 say that is because the map I.D. -- I need to
2 know the map I.D. of your house in this study
3 and compare it to the one in the 2016 Epsilon
4 study, and I just can't do that on the fly
5 here.

6 Q. I can tell you. We are number -- we're No. 56.
7 Our coordinates are 273313.64. And the other
8 coordinate is 63381.7. And this is on, says
9 Page 2 of 4, but it's in your Appendix A.

10 A. I guess if I'm going to try to answer this, I
11 need to have a current shadow flicker study in
12 front of me, which I don't have.

13 Q. You don't have your shadow flicker?

14 A. No. You gave me the 2011 report.

15 Q. Yes. I could give you mine, but then I don't
16 have mine for questioning. I'll give you mine.

17 MS. BERWICK: Could Mr. Needleman
18 provide it for him?

19 MR. IACOPINO: Do you know what
20 exhibit it is?

21 MS. BERWICK: It's Attachment 6 of
22 the current Application.

23 MS. MALONEY: Appendix 13B.

24 MS. BERWICK: It's Appendix 13B for

1 the 2011 one. But for the 2015, this is the
2 current one. I thought it was Appendix --
3 Attachment 6.

4 WITNESS O'NEAL: I have it back in my
5 notebook. May I step down for a moment to get
6 my own copy, which I have?

7 PRESIDING OFFICER SCOTT: Why don't
8 we go off the record. Go ahead and do that.

9 (Pause in proceedings)

10 PRESIDING OFFICER SCOTT: Back on the
11 record.

12 So, Mr. O'Neal, can you direct
13 us? Is this the December 22nd, 2014 study?

14 WITNESS O'NEAL: This is the
15 December 22nd, 2014, revised February 17th,
16 2016, shadow flicker analysis.

17 PRESIDING OFFICER SCOTT: Okay. So I
18 need to find that. Can you give us the exhibit
19 number?

20 MR. NEEDLEMAN: It's part of the
21 Application, Mr. Chairman. I'm not sure.

22 MS. BERWICK: It's Attachment 6.

23 MR. NEEDLEMAN: It's Attachment 6.

24 MR. RICHARDSON: I have it as

1 Attachment 9. Is that a different document?

2 MS. BERWICK: I could be wrong.

3 MS. MALONEY: No, no, it's six.

4 CMSR. ROSE: Nine is the noise
5 report.

6 MR. IACOPINO: It's Appendix 13B to
7 the Application. That says "Final 12/22/14."

8 MS. WEATHERSBY: Attachment 6.

9 MR. IACOPINO: Do you know which
10 supplement?

11 MS. BERWICK: Yes. It's Appendix A,
12 and I'm specifically looking at Page 2 of 4 it
13 says in that section.

14 MR. IACOPINO: Do you know which --

15 MS. BERWICK: Appendix 6.

16 MR. IACOPINO: Mr. Needleman, do you
17 know which --

18 MR. NEEDLEMAN: I think it was filed
19 February 19th in conformance with the new
20 rules. Attachment 6.

21 MR. IACOPINO: Yeah, it's in the
22 supplement, I guess.

23 WITNESS O'NEAL: I'm behind everybody
24 up here. Sorry.

1 PRESIDING OFFICER SCOTT: Why don't
2 we go ahead.

3 MS. BERWICK: Okay.

4 BY MS. BERWICK:

5 Q. In this attachment, according to the
6 coordinates that were given before, we are...
7 No. 56 is our house and 57 is our shed, our
8 barn. And do you see that we have an expected
9 shadow flicker of 8 hours and 21 minutes?

10 A. Would you mind just reading me your coordinates
11 again so I make sure I have the right receptor?

12 Q. Certainly. Hold on. 273313.64 and 63381.73.

13 A. Okay.

14 Q. We have a potential shadow flicker of 27 hours
15 and 30 minutes and expected shadow flicker of 8
16 hours and 21 minutes. Do you see that?

17 A. I don't think I'm looking at the same document
18 you are. I'm looking at the official -- well,
19 the Shadow Flicker Analysis Report, Revised
20 February 17, 2016. I'm looking at Table 5-1,
21 which has some expected shadow. And I see your
22 receptor and then I see the 8 hours and 21
23 minutes in the table I'm looking at. So we can
24 go on from that perhaps.

1 Q. It's the same thing. So, the difference
2 between those two studies -- our house, by the
3 way, I'll just point out, is in the same
4 place -- is almost an hour difference; is that
5 correct?

6 A. That is correct.

7 Q. In the 2011 flicker study, the same place I had
8 you there before, Figure 42, Page 7, can you
9 see what it says about the assessment of the
10 visibility of the turbines from our location?
11 Again, in the 2011 flicker study, we are 58 and
12 59.

13 A. There's a column in this table that says, "Is
14 the project visible?" and either a "Yes" or
15 "No."

16 Q. And what does it say?

17 A. For your house it says "no."

18 Q. No visibility; is that correct?

19 A. That's what it says.

20 Q. Okay. I just wondered, since you actually came
21 out to our house and saw the meteorological
22 tower from our yard, didn't it cause you to
23 question the validity of this visual
24 assessment?

1 A. Again, we did not do this 2011 report, so I
2 can't answer your question.

3 Q. Okay. All right. I'd like to talk about the
4 discrepancies I see between the number of
5 possible daylight hours in your report. And I
6 hold up the month of May, and you have the
7 possibility of sunshine or possible daylight
8 hours at 55 percent for the month of May. Now,
9 May 1st has a sunrise at 5:41 and a sunset of
10 7:49; that's 14 hours and 8 minutes. For the
11 last day in May, the sun rises at 5:12 and sets
12 at 8:20, making a possible 15 hours and 8
13 minutes. So, by my calculations -- and I
14 actually did run this by my meteorological
15 nephew to make sure I wasn't making a fool of
16 myself -- even on the first day of the month,
17 the possible hours of sunshine would be
18 58 percent, and the last day of the month it
19 would be 63 percent; yet, your report has for
20 the entire month of May 55 percent, which is
21 less than the first day of May. Why is that?

22 A. Sure. There's a good explanation for that.
23 You're looking at two different parameters.
24 I'm sorry. I'm looking at Mr. Needleman, but

1 you're right behind him. So, apologies.

2 So we're talking about two different items
3 there. If you're trying to calculate how many
4 hours of possible sunlight there are per month,
5 you're right, that's a different number. And
6 that number, that calculation is done by the
7 software. That's done for every month, and
8 it's in the appendix. So, for example, in the
9 month of May, there are 454 hours of daylight
10 over the course of the month of May. So that's
11 all taken into account. The actual sunrise and
12 sunset for every day of the month, every day of
13 the year is taken into account, knowing the
14 latitude and longitude of where we are in
15 Antrim. What you're looking at for the percent
16 of possible sunshine, for example, May, you
17 said 55 percent, which is the number that's in
18 the report, that's correct. What that means is
19 during the month of May -- use May 1st as an
20 example. During the month of May, where there
21 are as much as 454 hours of possible
22 sunshine -- in other words, from sunrise to
23 sunset every day, if you added it together it's
24 454 hours. It is not sunny 100 percent of the

1 time here in New Hampshire. So, based on
2 long-term meteorological data collected by the
3 National Weather Service, and publicly
4 available, we got this information for each
5 month of the year. And so, for example, May,
6 it's saying about 55 percent of the time when
7 the sun could be shining, it is actually
8 shining. That's what that means.

9 Q. I thought that this number was supposed to be
10 the number of possible daylight hours, not the
11 number of anticipated. I would think that if
12 you added clouds into it -- and I would point
13 out that this summer we had almost no clouds
14 almost every single day. But if you add clouds
15 to it, aren't you not, not given a report about
16 the possible number of daylight hours, but the
17 anticipated, hypothetical chances of sunlight
18 hours? I mean, it says "possible daylight
19 hours."

20 A. Which table are you looking at now?

21 Q. I'm looking at May, 55 percent of possible
22 sunshine.

23 A. Right. So, in New Hampshire, it is not sunny
24 every minute of the day, every day of the

1 month. That's a fact. So the weather service
2 keeps, you know, long-term records of the
3 percentage time that it is sunny every given
4 month. So, what the shadow flicker program
5 does is says, all right, every day the sun
6 could be up for this many hours and applies a
7 percentage. So it reduces the possibility of
8 getting shadow flicker because the sun is not
9 up -- is not out 100 percent of the time. So,
10 that 55 percent gives you a more realistic
11 number of expected shadow flicker.

12 Q. It also could be expected. It also could be --
13 it's not possible. It's expected. Isn't that
14 different?

15 A. Right. And the SEC rules are pretty clear. We
16 provided two numbers: The astronomical
17 maximum, which I think is perhaps what you're
18 thinking of, and then the expected.

19 Q. So, is the astronomical maximum the 29 hours
20 that we have on our property, 29 hours and 30
21 minutes -- or 27 hours and 30 minutes, is that
22 based on 55 percent, or is that based on the
23 actual percent of sunshine that absolutely
24 could be, not including clouds? Because I

1 thought the clouds was when you had the
2 "expected" shadow --

3 A. That's correct.

4 Q. -- not the --

5 A. So, the "astronomical maximum" means -- and
6 let's take a second. I'll go to the report to
7 find the exact wording. That might be helpful.

8 (Witness reviews document.)

9 A. So I'm looking at Page 4-1 in the report. I'm
10 not sure if those page numbers match the
11 document you're looking at. But there is a
12 modeling methodology discussion there.

13 Q. Okay.

14 A. Were you able to find that?

15 Q. Yeah.

16 A. Okay. In the first paragraph of that, it talks
17 about the resulting worst -- about halfway
18 down, "The resulting worst-case maximum" -- I'm
19 sorry. "The resulting worst-case calculations
20 assume that the sun is always shining during
21 the daytime [sic] and that the wind turbine is
22 always operating." So that assumption gives
23 you, yes, those 20 -- I don't remember the
24 number you said, 27 hours and change perhaps?

1 Q. Yes. Twenty-seven and a half.

2 A. So, those -- that number assumes that there's
3 never a cloud in the sky the whole time and
4 that turbines are always spinning.

5 Q. And does it assume maximum possible sunshine in
6 May of 55 percent, or is it more towards
7 similar between 63 and 58?

8 A. No, it assumes 100 percent. It assumes the sun
9 is always shining when it can be up.

10 Q. That's what I'm asking, because this 55 percent
11 would seem to be when the sun is up.

12 A. That's correct. You're not going to have
13 shadow flicker when the sun's not up during the
14 middle of the night. So we're just looking at
15 daytime hours.

16 Q. But the 55 percent you've told me includes
17 clouds.

18 A. That's correct.

19 Q. So how can that be the astronomical maximum
20 when it says the sun is always shining
21 somewhere in here?

22 A. No. So there's two sets of calculations --

23 Q. Maximum daylight sunshine -- sunlight. Sorry.

24 A. So, there's two sets of calculations. The

1 astronomical maximum doesn't use that
2 55 percent you see in the table. Just pretend
3 it doesn't exist. It uses 100 percent.
4 Assumes the sun is always shining during
5 daylight hours. The expected shadow flicker is
6 what that incorporates; more realistic,
7 possible clouds, the fact that the wind doesn't
8 blow 100 percent of the time. Those two
9 adjustments are made.

10 Q. I could understand that. I'm having a hard
11 time understanding why you say, then, that the
12 "possible sunshine" -- "possible sunshine"
13 would seem to me that that is a number that you
14 program into your program that figures out
15 shadow flicker. You have a whole lot of data
16 you need to put in that program; correct?

17 A. Correct.

18 Q. And one of them is the "possible" sunshine?

19 A. That's correct.

20 Q. And when you figure out the astronomical
21 maximum time, did you put in 55 percent for
22 May?

23 A. No. For the astronomical maximum, we assumed
24 100 percent; the sun was always shining.

1 Q. Twenty-four hours a day.

2 A. No. The sun doesn't shine 24 hours a day.

3 Q. Well, that's what I'm asking you.

4 A. No. I said during daylight hours. During
5 daylight hours we assumed 100 percent sunshine
6 during the daytime.

7 Q. And so you don't provide those numbers in your
8 report, what you put in?

9 A. I'm not sure I understand what you're asking.

10 Q. What you provide in your report for maximum
11 possible sunshine is less than the maximum
12 possible sunshine. So I'm asking if you have
13 it in your report somewhere where the actual
14 numbers are that you did input for maximum
15 possible sunshine for the figures that came out
16 with the astronomical maximum shadow flicker
17 hours.

18 A. Well, certainly we discuss it in that sentence
19 that I just read to you, which said the
20 calculations assume the sun is always shining,
21 again, for the astronomical maximum. If you
22 want to see the details of how many hours per
23 day, you can look in Appendix C, which gives
24 you detailed calendars for every month of the

1 year, and it shows you sunrise and sun-up times
2 for every day of the year back there and --

3 Q. So do you put those numbers in rather than this
4 55 percent, or do you put a percentage in?

5 A. So, there's two sets of calculations. We do it
6 both ways. One set of calculations assumes
7 100 percent of the sunshine during daylight
8 hours, and the second set of calculations which
9 uses -- and you can see them, they're in the
10 back here. It says "sunshine probability" for
11 each month of the year. And those percentages
12 are in the back in those spreadsheets. So,
13 those numbers allow you to calculate the
14 expected shadow flicker.

15 Q. Right, and that's what has me concerned,
16 because I understand "probability" and I
17 understand "possible." I just don't understand
18 why the numbers that you have listed for
19 "possible" are not "true possible."

20 A. But I guess I disagree. They are. There's two
21 sets of numbers. There's one that's the
22 astronomical maximum. You cannot have more
23 than that because it assumes that every minute
24 of every day of the year the sun is shining

1 from sunrise to sunset. And it just doesn't
2 happen.

3 Q. I understand that.

4 A. Okay.

5 Q. Okay. I think I'll go on.

6 The data that you need to input, besides
7 the number of daylight hours, in order to
8 calculate your flicker analysis, does it also
9 include the expected wind direction and -- does
10 it also include the expected wind direction?

11 A. Yes. Yes.

12 Q. And the number of days of cloud cover expected?

13 A. Right. Table 4-2 in the report has a
14 discussion of hours by each wind direction.

15 Q. Okay. If these numbers were changed slightly,
16 would they also create different flicker
17 calculations?

18 A. I wouldn't expect any material difference.

19 Q. So I'm trying to figure out how I got a house
20 flicker changed by almost an hour, from 9 hours
21 and 17 minutes to 8 hours and 21 minutes
22 between flicker analysis reports. The hub for
23 your new turbines would be half a meter higher
24 and the blades would be 3 meters less.

1 Otherwise, the factors should be pretty much
2 the same because we are not near the turbine
3 that was removed or the turbine that was
4 reduced by a significant amount.

5 A. The only thing I can think of -- and again, we
6 didn't do the 2011 report. But it was a
7 different turbine, slightly different
8 dimensions. And I -- my expectation would be
9 that that would be the reason why, because
10 obviously the location of your house hasn't
11 changed during that time. I don't recall,
12 offhand, if the locations of the nine Antrim
13 Wind turbines were shifted a little bit from
14 2011 to 2016. That could be another possible
15 reason. I don't recall.

16 Q. Okay. Even with all the reductions for
17 "possible" cloud cover, reduced hours of
18 sunshine, isn't it true that our house, Jan
19 Longgood's, Clark Craig's, Tena Phillips',
20 Garrett Spencer's, Mr. Ivy's, Ken Schrapel and
21 many more will receive over the SEC-allowed 8
22 hours of expected flicker?

23 A. I can't comment on the names you just read.
24 I'm sorry. I just have an I.D. number.

1 Q. So, many residents.

2 A. There are 24 locations that are predicted to be
3 at 8 hours or more than the SEC limit. And
4 obviously, the Company is going to use a
5 mitigation package to reduce that to the
6 expected amount. I believe Mr. Kenworthy
7 discussed it earlier in the proceedings.

8 Q. So, according to your testimony, then, this
9 project does not meet the requirements of the
10 SEC unless they use an unproven, untested,
11 being-created-only-for-this-project program; is
12 that correct?

13 A. I guess I can't agree with the characterization
14 you just made about the technology. But the
15 Company will have to meet the rules. And
16 they've got an agreement with Siemens or
17 another third-party vendor, and they're going
18 to comply with the rules. They have to.

19 Q. Okay. Moving on.

20 Can you explain how, according to your
21 noise report, under 6- -- 6.2, you state,
22 "Overall, ground level winds were light, below
23 2 meters per second at locations L1 through
24 L4." And please note that our yard was Location

1 L4. Yet, by my own calendar, I recorded very
2 significant wind conditions, in fact, howling
3 winds, which I later verified by weather
4 reports from the Jaffrey airfield reports.

5 A. I'll try to answer your question in general
6 terms. If we need to get specifics, I'll have
7 to have the report in front of me. I don't
8 have it. But I think we talked a little bit
9 about this at the technical session.

10 A couple things. The wind speeds measured
11 at the back yard of your home were measured
12 about 1-1/2 meters above the ground, about
13 5 feet above the ground. And they were near
14 the woods, somewhat sheltered and protected.
15 The wind speeds at Jaffrey are at an airport,
16 has much more wide-open exposure. And they're
17 also measured at a height of 10 meters above
18 the ground, or 33 feet above the ground. So
19 it's two very different wind regions we're
20 talking about. I would say that's the general
21 reason why you really can't compare those two.

22 Q. I'm going to have to disagree with you. But
23 I'm going to read you this statement that will
24 explain why I'm disagreeing with you.

1 MR. NEEDLEMAN: I'm sorry. Can you
2 tell us where the statement is from?

3 MS. BERWICK: Yes. It's in his
4 current report, Section 5.4.4. I will quote --

5 PRESIDING OFFICER SCOTT: You will
6 have a question at the end of this; right?

7 MS. BERWICK: Yes, I do.

8 BY MR. BERWICK:

9 Q. "One continuous, programmable, unattended
10 sound-level meter was placed in the back yard
11 of 72 Reed Carr Road near a garden facing the
12 ridgeline where the proposed turbines will be
13 located." That statement isn't true, is it?

14 A. That statement's true.

15 Q. Wasn't the sound meter placed out by the stone
16 wall, way towards the back? The stone wall.
17 Everyone saw that huge pine tree. So, go way
18 over to the right, not up by the raised garden
19 beds. But the wind equipment was placed up by
20 the raised garden beds.

21 A. That's right. Yes.

22 Q. So, the unattended sound-level meter was not
23 placed facing the ridgeline near the garden,
24 for sure. It was way back by the stone wall.

1 I don't know if it was facing the ridgeline or
2 not.

3 A. It's true. It was placed back by the stone
4 wall. If you recall, that was at your request.

5 Q. It was at my request, yes.

6 A. Okay.

7 Q. And so your statement that you just made about
8 the wind, where you said it was sheltered by
9 the woods, the wind equipment that you had was
10 placed by the raised beds, which is in a pretty
11 open area. I don't have any trees around
12 there. It goes down the hill. So, the fact
13 that the woods would not be sheltering, that's
14 why I'm disagreeing with the statement that you
15 made.

16 A. Is that a question or a statement?

17 Q. Okay. So, shouldn't that have recorded wind
18 gusts that were very significant in the
19 position where it was?

20 A. So, the instrument did record wind gusts, as
21 well as steady wind speeds. And both sets of
22 that information were provided after the
23 technical conference. Again, wind gusts, I
24 would expect them -- and the data prove that

1 those wind gusts were lower than what was
2 measured over at the Jaffrey Airport, which
3 makes sense. I would not expect them to be the
4 same.

5 Q. But in your report, under 6.2, you state,
6 "Overall, ground-level winds were light, below
7 2 meters per second." And if I could refer you
8 to my Jaffrey wind report, off the top of my
9 head, they were very significant winds. They
10 were very significant, howling winds, weren't
11 they?

12 A. The data that you showed me from Jaffrey had
13 some significant wind gusts, yes.

14 Q. Many days of significant winds during that
15 two-week period.

16 A. I guess what I would say is I'm fully confident
17 in the equipment we put out there. The wind
18 speeds we measured, the data for all that is in
19 the back of the report. It shows wind speeds
20 that were generally 2 meters per second or
21 less, except down at Gregg Lake, which had a
22 more open exposure and the winds speeds were
23 higher down there. But again, I'm confident of
24 all of our equipment there and have no doubt

1 that it functioned properly, and I stand behind
2 the data.

3 Q. Even if it functioned properly, with it being
4 70, 80 feet away, would it really be relevant
5 to the noise levels that you heard on the
6 sound-level equipment?

7 (Court Reporter interrupts.)

8 Q. The wind-level equipment was up on the top of
9 the hill, and the noise-monitoring equipment
10 was down back by the stone wall. And so the
11 wind -- I just wondered how you can correlate
12 those two.

13 A. There was a separation there, obviously, as we
14 discussed. However, that type of separation
15 would not materially affect the wind-speed
16 data.

17 Q. So, while I was just sitting in my house, just
18 being a normal person and hearing the wind
19 howling and writing it on my personal calendar,
20 just because I was concerned that maybe
21 everything wasn't quite being recorded
22 correctly, it was just irrelevant noise I was
23 hearing?

24 A. No, I'm not saying it was irrelevant noise.

1 I'm saying the wind speeds that we measured
2 were within the parameters. The SEC has very
3 strict rules, that if the wind speed is over
4 4 meters per second where you measure the
5 sound, then you exclude those values. And if
6 it was, we did exclude those.

7 Q. All right. I'm going to go on.

8 Did you exclude the wind gusts? Did you
9 include wind gusts in your report?

10 A. I don't believe the data for the wind gusts are
11 in the report. They were provided to you
12 following a technical conference.

13 Q. Did you correspondingly eliminate the noise
14 data for the same times as the wind gusts?

15 A. I'm not sure what you mean.

16 Q. Well, the wind makes a lot of noise. In fact,
17 soon, in the fall, we'll get going again.
18 Really a lot of noise. So much noise, that
19 when I'm walking down the road, I can't tell if
20 there's a car coming. I have to really be
21 careful. It makes a lot of noise. And the
22 wind was gusting majorly during multiple days
23 of this study. So you said during the
24 technical sessions that you did not include the

1 wind gusts in your report and then, I guess,
2 saying you made them available. Don't really
3 remember that, but that's okay.

4 What I'm asking is, did you eliminate --
5 if you did record the wind gusts, say there was
6 a 70-mile-an-hour wind, did you eliminate the
7 noise, the recording? Did you deduct that from
8 there just like you say you did for
9 precipitation; you don't record the noise
10 during precipitation? Did you record it during
11 those major wind gusts?

12 A. Not during the gusts, per se. Remember, we
13 have a large wind screen over the microphone
14 which cuts down a lot of the wind noise.
15 Doesn't eliminate 100 percent of it, but it
16 cuts down the wind noise. Anytime the steady
17 wind speed was 4 meters per second or higher,
18 we did eliminate that.

19 Q. Steady wind speed.

20 A. Right.

21 Q. But on the data that I got from the Jaffrey
22 Airport, these were gusts. Almost every hour,
23 gusts up to 39 miles an hour, gusts up to
24 29 miles an hour, gusts up to... so, gusts,

1 were they excluded?

2 A. I think if you look at the sound data that were
3 collected in your back yard, you'll see some
4 fairly low sound levels.

5 Q. Actually, I see they seem quite high for what I
6 live with. And I do know a little bit about
7 sound levels because I used to test hearing.
8 So, 60 decibels -- 14 decibels at night,
9 absolutely agree with; 60 decibels during the
10 day, I have a hard time believing that one.

11 Okay. Your results show that the
12 property's steady-state L90 measurements ranged
13 from 14 to 50 decibels on our property, while
14 the Route 9 location ranged from 18 to 53. So,
15 we were 14 to 50 and they were 18 to 53. And
16 this is right down near Route 9. And doesn't
17 that seem quite strange when we hear very
18 little traffic noise, whereas Route 9 has
19 constant traffic noise?

20 A. Doesn't seem strange at all. There are always
21 localized sources of sound everywhere. Again,
22 it would be helpful if I could get a copy of
23 the report we're talking about. Can we go off
24 the record and I can get a copy of my own?

1 PRESIDING OFFICER SCOTT: Let's do
2 that.

3 (Pause in proceedings.)

4 PRESIDING OFFICER SCOTT: Back on the
5 record.

6 BY MS. BERWICK:

7 Q. The sound-level modeling results showing the
8 decibels that could be created by the wind
9 turbines at our residence in the 2011 report --
10 did you do that report, or was that not done by
11 you either?

12 A. Yes, we did do that one.

13 Q. Okay. So the results of that 2011 report was
14 that, at our location, at our house, the median
15 would be 46 decibels, with a maximum of 63; and
16 yet, in your present report you report 35.7.
17 Can you explain how that reduction of so much
18 was done?

19 A. Let me make sure I understand what you're
20 saying. You gave a large range there a minute
21 ago.

22 Q. Yup.

23 A. Was that the measured sound-level data from
24 2011?

1 Q. Do you still have my report? I can't look it
2 up.

3 A. I do still have it.

4 Q. It's in that report of yours. You gave a range
5 of, it's called "sound-level modeling results."

6 A. Can you give me a page number or table number?

7 Q. No, but I folded the page, I believe, but I'm
8 not positive, on the bottom.

9 (Witness reviews document.)

10 Q. Did you find it?

11 A. I've got a Table 7-2 which has our modeling
12 results.

13 Q. Okay.

14 A. Is that --

15 Q. Let's review it. I will again tell you that we
16 were in that flicker study, No. 58 and 59.

17 A. Yes, I see that.

18 Q. And so what do you have for decibels at our
19 property?

20 A. So, in the 2011 study, we modeled 39 decibels
21 at Receptor 58.

22 (Court Reporter interrupts.)

23 Q. Wait. I didn't say 58. Oh, yeah. I'm sorry.
24 I did.

1 Do you have another page in there that has
2 median and maximum on there?

3 A. Yes, we do. That's in an earlier chapter which
4 discusses what we actually measured actually
5 pre-construction. So it has nothing to do with
6 the wind turbine that we're discussing today.

7 Q. All right. I have to look at it again to make
8 sure I was asking the same question. So this
9 was modeling results.

10 MR. RICHARDSON: Mr. Chairman, I'm
11 having some difficulty understanding the reason
12 why the prior project, which had a different
13 type of turbine and a different number of
14 turbines, would --

15 MS. BERWICK: I can answer --

16 MR. RICHARDSON: I mean, I'm not
17 necessarily objecting to the question. But I
18 just don't understand why we're going down this
19 road. Because it would seem the results would
20 be expected to be different in 2011, and that's
21 not the project we're reviewing.

22 MS. BERWICK: I could answer that.
23 The decibels produced by the turbines are
24 almost identical. The height of the hub is

1 actually half a meter higher. The blade length
2 is only 3 meters less. And we do not have
3 any -- we were not affected by the turbine that
4 was removed. So you would expect that, for the
5 sound levels, that they would be very
6 comparable. And if there's a major difference,
7 I think it shows that with just a little bit of
8 difference in the input of numbers, you can get
9 the results that you want to show.

10 PRESIDING OFFICER SCOTT: Okay. And
11 are you going to ask Mr. O'Neal why the
12 difference?

13 MS. BERWICK: Yes, I was.

14 BY MS. BERWICK:

15 A. So if I understand the current analysis -- I'm
16 now looking at my February 17, 2016 sound
17 report. And if I understand you, I think you
18 said your receptor I.D. No. 56 today in the
19 current report --

20 Q. In our current report? Yes, we're 56 today.

21 A. Okay. So, in 2011 you were modeled to be 39.

22 Q. We were 58 in 2011.

23 A. I.D. No. 58, yes.

24 Q. I.D. No. 58, yes.

1 A. So the sound level predicted in 2011 at I.D.
2 No. 58, your house, was 39. The sound level
3 predicted in 2016 at Receptor No. 56, which I
4 think is still your house, is 36. So it's gone
5 down by about 3 decibels.

6 Q. I don't have my report, so it's hard for me to
7 be doing this, but --

8 (Court Reporter interrupts.)

9 Q. I'm going to move on. Can you tell me how much
10 of an increase in sound there is between
11 14 decibels and 40 decibels?

12 A. That's a significant increase from 14 to 40,
13 yeah.

14 Q. Twice as loud? Three times as loud? Eight
15 times as loud? Ten times?

16 A. More than 10 times as loud.

17 Q. Okay. Because right now you measured our
18 nighttime around 14, and it could go up to 38
19 or 40. That's a significant increase, wouldn't
20 you say?

21 A. You're predicted to be 36 decibels at your
22 house.

23 Q. So how much is the difference between 14 and 36
24 then?

1 A. Okay. So that's a fair question. So the
2 number of 14 decibels is measured when there's
3 absolutely no wind, okay. It's dead calm.
4 Wind turbines will not be operating in dead
5 calm. Even with wind shear conditions it will
6 not be operating. So it's never a fair
7 comparison to look at sound levels under dead
8 calm conditions versus the predicted
9 conditions. Model level of 36, worst case at
10 your house are well under the SEC limit of 40
11 at night.

12 Q. But how much of a difference is it between 14
13 and 36?

14 A. I will answer --

15 Q. Eight times? Ten times?

16 A. I think I answered that. It's more than 10
17 times difference. But it's really not an
18 apples-to-apples comparison.

19 Q. My son went out last night with his little cell
20 phone thing and measured it; 14 decibels is
21 what he got.

22 All right. That's all my questions.

23 Thank you.

24 A. Would you like your report back?

1 Q. Yes. Do you need it for the rest of the -- you
2 might need it.

3 A. I don't know.

4 Q. I can wait.

5 PRESIDING OFFICER SCOTT: Okay.

6 Mr. Block.

7 MR. BLOCK: Thank you.

8 CROSS-EXAMINATION

9 BY MR. BLOCK:

10 Q. If you'd indulge me for just a minute here, I'd
11 like some information out of "Shadow Flicker
12 Management for Dummies," some basics.

13 Does "shadow flicker," by definition, only
14 occur within a structure, or can it be
15 experienced outdoors?

16 A. Shadow flicker could be experienced indoors or
17 outdoors under the right conditions. You know,
18 if you have a window that's facing a turbine,
19 that can cause shadow flicker. And if the
20 blinds are open under those conditions, there
21 could be shadow flicker inside a house. It's
22 possible, yes.

23 Q. Okay. Am I correct in assuming or figuring
24 that Antrim Wind is bound by certain

1 regulations to limit shadow flicker in certain
2 instances? Is that correct?

3 A. They must meet the SEC rules of 8 hours per
4 year, yes.

5 Q. And that has to be done physically by shutting
6 down a turbine; is that right, if necessary?

7 A. I believe that you heard earlier testimony
8 about the mechanics, the engineering principles
9 of how it's going to be done. But there's
10 going to be a system in place to monitor that
11 and measure it and shut down when they reach
12 the eight-hour limit.

13 Q. Now, the question I have on this is, you talk
14 in your report about "receptors." The
15 receptors, are they basically only structures?

16 A. They are structures, yes.

17 Q. Okay. So, the receptors and the predicted
18 amount of shadow flicker at receptors
19 determines what needs to be managed or
20 controlled; is that correct?

21 A. That's correct.

22 Q. Okay. So the question I have right now is, the
23 plan, whatever it is that would be put into
24 place, does it include only structures that are

1 standing at the time of construction; in other
2 words, what's assessed on your plan and your
3 assessment right now?

4 A. That's my understanding.

5 Q. So the question is, since the Project could be
6 in operation for decades, what happens about
7 any future structures, future construction, if
8 somebody were to build another house? Is
9 Antrim Wind obligated to monitor and control
10 shadow flicker in structures erected at any
11 point in the future?

12 A. That sounds more like a legal question. I'm
13 not sure I'm qualified to answer that.

14 Q. Well, that's my question. I mean, I own 19
15 parcels of property. If I wanted to build
16 another house -- actually, my son has talked
17 about doing this on one of my parcels. Some of
18 my property is as close as 3500 feet to the
19 turbines down along the river. Is there some
20 consideration at that point, when that happens,
21 to what the effect of shadow flicker might be
22 on that structure, or is it just whatever
23 happens, happens, and there's no recourse on
24 that?

1 A. Again, I don't feel that I can -- I'm qualified
2 to answer that question. Obviously, you know,
3 there will be some mechanism of communicating
4 with Antrim Wind if there is an issue. I would
5 assume that you could communicate with them if
6 there is an issue.

7 Q. All right. Just got one other thing. I want
8 to ask a little bit about sound.

9 For almost 30 years we've lived up in the
10 North Branch area. Moved there 'cause it was
11 nice and quiet. The sound at our house on a
12 quiet evening has been measured at about
13 19 decibels. I'm told it could rise to
14 anywheres from 32 to 39 when the wind turbines
15 are in operation. If I've calculated that
16 correctly, we're talking about three to four
17 times increase in sound levels. Does that
18 sound accurate?

19 A. I mean, I guess. Can you tell me what house
20 number you are in the study?

21 Q. I don't know what number we are. We're on
22 Loveren Mill Road. It's just outside the
23 structure that's up on the -- probably halfway
24 up Loveren Mill Road there's two structures

1 very close together, if you're looking at the
2 map.

3 A. Right. So at that distance, you're talking
4 about probably somewhere in the very low 30s,
5 30, 31 decibels on the Project.

6 Q. Right. Well, Mr. Kenworthy handed me a paper
7 last week on the site visits that indicated the
8 modeled sound would be about 31.8.

9 A. Okay.

10 Q. And from what you're saying, there are times
11 when it could go higher than that, up to maybe
12 38 or so on a particularly windy day or so. Is
13 that possible?

14 A. No, I didn't say that. The predicted numbers
15 here are the worst-case numbers. They are
16 turbines operating under full power.

17 Q. At least about a three-times increase in the
18 worst-case situation.

19 A. Again, the SEC has set the nighttime limits of
20 40. This is way, way below the 40s.

21 Q. And I've been told that it's not so much the
22 loudness, but it's the change in the character
23 of what we would hear. And that, to me, the
24 sound of the blades have been described that it

1 might be like living half a mile from a busy
2 highway, especially at night.

3 So my question is: Do you think that it's
4 acceptable to impose this permanent change to
5 our lives?

6 MR. NEEDLEMAN: I'm going to object
7 to that question. I think that's beyond the
8 scope of the witness' testimony.

9 PRESIDING OFFICER SCOTT: Sustained.

10 BY MR. BLOCK:

11 Q. And I guess a follow-up question to that, and
12 you may or may not answer, is should we be
13 asked to just accept this?

14 MR. NEEDLEMAN: Same objection.

15 PRESIDING OFFICER SCOTT: Sustained.

16 MR. BLOCK: I will end my questioning
17 with that. Thank you.

18 PRESIDING OFFICER SCOTT: Thank you.

19 Ms. Allen.

20 MS. ALLEN: No questions.

21 PRESIDING OFFICER SCOTT: That leaves
22 or brings us to Mr. Ward -- Dr. Ward. Excuse
23 me.

24 DR. WARD: "Fred" will do.

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CROSS-EXAMINATION

BY DR. WARD:

Q. I'm a fellow meteorologist. We have some things in common. I hope we agree that we have lots of models, and these models cover all kinds of situations. It's always interesting to watch the television when there's something going on with a hurricane and they put on the tracks from, I don't know, 20 or 30 models, and it almost looks like somebody's thrown spaghetti on the map because they cover quite a large range.

The reason I mention that is, every model that I've ever seen, and I've been around even longer than you have, there are always uncertainties there. And the uncertainties can be handled, like, for example, on television with the hurricanes, by just looking at a number of different models, and they'll give you an idea of how good or bad things are.

We're confronted here with just one model. I assume there are no others. And that's a question.

A. The SEC guidance is quite clear on the

1 standards that we're supposed to use to do the
2 modeling and calculations, the ISO 9613
3 standard.

4 Q. But you could, in order to get some idea of the
5 uncertainty, as an expert in this, bring in
6 results of some other modeling; could you not?

7 A. The way we would handle that is, again, you
8 know, we're going to follow the rules, follow
9 the SEC standards.

10 Q. I understand that.

11 A. But we are going to incorporate uncertainty
12 where it's appropriate, and that's what we did
13 in this study.

14 Q. And would you care to say where the uncertainty
15 is handled in ISO 9613-2?

16 A. Well, first of all, I guess the SEC rules are
17 quite clear. They want you to include the
18 uncertainty from the wind turbine
19 manufacturers. So, every wind turbine
20 manufacturer tests their wind turbines and
21 comes up with a sound power level, plus or
22 minus some uncertainty. So that uncertainty is
23 what we add to the modeling predictions, again,
24 as per the rules.

1 Beyond that, the rest of it is just
2 handled in terms of using other worst-case
3 assumptions. What we have found with the
4 inputs we've used for this project, as well as
5 previous projects in New Hampshire and
6 elsewhere, is that the measured values really
7 stack up very well to the model values. They
8 are below the model values. So we have high
9 confidence in the modeling.

10 Q. Well, you say that, and others testifying for
11 Antrim Wind keep falling back on, "We've seen
12 it and it works fine and it's better than
13 anything." I've never heard any of them say,
14 "Jeez, the thing didn't quite work." As a
15 meteorologist who's made forecasts, I've seen a
16 lot of them that didn't work. And I'm always
17 amazed when somebody tells me in the midst of
18 something that is obviously uncertain, "Well,
19 it worked fine. It didn't hurt." So I hear
20 that time after time after time. And when I've
21 asked the question, I don't quite get an answer
22 to, "Why are you so certain?" So let me ask
23 some specific questions.

24 When I ask the questions about the

1 uncertainty, you brought in the manufacturer's
2 uncertainty, and you did not bring in any
3 uncertainty about the modeling. Is that true?

4 A. That's true.

5 Q. Okay. Is there some reason for that?

6 A. There is no other uncertainty strictly
7 specified in the modeling. And again I'll go
8 back to with the inputs that we've used for
9 years and years and years, in the real world we
10 have found that those have been proven by
11 actual measurements of wind turbines. So we
12 feel confident.

13 Q. Okay. That was where I was going to start. I
14 have a logic problem, and maybe you could help
15 me with it.

16 In your model, whatever the thing is, you
17 name it, the only parameters that I see that
18 change for Antrim from any other wind project,
19 Groton or Lempster or whatever, are the
20 intensity of the sound and a little bit on the
21 topography, not really recognizing a lot of
22 differences, but that some places can cut off
23 others. Are there any other things in that
24 that would change other than those two things?

1 A. So you raise a good point. It's been very well
2 established that -- you're right. There are
3 some other small switches, ground attenuation,
4 some meteorology, which have a very small
5 impact on the ultimate results. What's most
6 important in doing the modeling, and this has
7 been proven time and again in some research
8 papers which I could cite, is that the sound
9 power levels of the source -- so, the wind
10 turbine sound power levels -- that is really
11 very important. You've got to get those right.
12 And the distance. Those two things are going
13 to generally control the answer. So, how far
14 away the source is from the home or
15 residence --

16 Q. And whether it's visible because of the
17 topography or whatever.

18 A. Yeah. If you've got a mountain blocking it,
19 that will provide some additional reduction.

20 Q. Okay. So if that's true, and I gather from
21 what I've seen in the modeling it is true, then
22 why do you bother using models if you could
23 just go up to an existing wind facility and you
24 would get the measurements and then you would

1 just change a couple numbers like that? Why
2 waste the time on these models, since they
3 really don't make any -- there isn't anything
4 inherently in the model that can't be handled
5 with a little mathematical fix.

6 A. It's not quite that simple.

7 Q. Okay. So tell me what it is then.

8 A. So, really what you want to do is you want to
9 take that same information that you say might
10 apply to other wind farms, but you've got to
11 bring it in to this site. So you need to have
12 this particular layout of wind turbines, which
13 the Antrim layout is different than the Groton
14 layout, and it's different than other wind
15 farms. And you also have to have the
16 residences, obviously --

17 Q. I'm sorry. I didn't hear you.

18 A. Sorry. The sensitive receptors, the
19 residences, you have to have those also
20 geographically laid out to do your distance
21 calculations. And so that is why you're going
22 to do it site by site using a general model
23 such as this.

24 Q. But having multiple turbines, that's just a

1 simple mathematical thing of adding one to the
2 other; is it not?

3 A. Lot of calculations.

4 Q. Pardon?

5 A. It's a lot of calculations. It is essentially
6 calculating things. You're right. But there's
7 a lot of calculations.

8 Q. Well, I guess I didn't ask my question right.

9 There are two ways of getting the numbers,
10 the noise numbers; isn't that true? You get
11 them out of a model or you can measure them.
12 Or is there a third way?

13 A. Well, in the case of Antrim, you can't measure
14 them because the turbines aren't here yet.

15 Q. That's what I'm getting back to. If you had
16 the measurements from Lempster or whatever, and
17 you make suitable adjustments for the
18 differences between the noise of the turbines
19 and things like that, and the distances and so
20 forth, which are not particularly
21 topographically important, then why do you need
22 the model? You just go and say these are the
23 numbers. These aren't any numbers I pulled out
24 of a mathematical model. These are the numbers

1 we get for a set turbine, and then we adjust
2 those for whatever the differences are between
3 wherever you got these numbers and the existing
4 and present situation, and you don't have to
5 have a model. You just say I adjusted it
6 because these turbines are a little louder or
7 softer or whatever. And maybe the G factor,
8 the ground thing, is a little different. But I
9 don't know what the model is doing for you. I
10 guess that's what I'm coming to.

11 A. I guess I would suggest that if one took that
12 approach of, say, going to Lempster and taking
13 a few measurements --

14 Q. Or anyplace.

15 A. -- or anyplace, you're still going to be
16 fraught with a lot of assumptions. It's a
17 different turbine, different distances. So,
18 why not just model the proper -- and this is
19 what we did and what's required -- model the
20 proper sources with the proper sound levels
21 over the proper distances to all the residences
22 and locations in Antrim.

23 Q. Well, the answer to that is simple: When I
24 tried to get hold of the models and things, I

1 can't get at those things. So I have no way of
2 testing the model. I don't know what's in it,
3 to tell you the truth. I'm assuming that it's
4 a pretty straightforward geometric thing, but I
5 can't prove that. So, then, let me pursue that
6 a little bit.

7 Tell me, just in a listing of order, what
8 are the technical factors that go into the
9 model? What are the things I need to know, the
10 input data?

11 A. Sure. So, that's all spelled out in the
12 standard, the ISO 9613-2 standard. It lists
13 everything that you need. So you need the
14 sound power level of the source that you're
15 interested in -- in this case, the turbines.
16 That then gets reduced --

17 Q. That's listed in the -- I have it in front of
18 me. Is that listed someplace in here?

19 A. Sure.

20 DR. WARD: And I will apologize to
21 the Committee. ISO 9613-2 is about as badly
22 written as anything I've ever read in my entire
23 life. So if this discussion gets a little
24 confusing, if it doesn't make sense to you, it

1 doesn't make sense to me either.

2 A. So, Table 7-1, sound-level study, has the sound
3 power level information for the turbines --

4 BY DR. WARD:

5 Q. Wait, wait. Table 7-1. I have a Table 5 and
6 then it goes to Table 8. I don't have a
7 table --

8 PRESIDING OFFICER SCOTT: We can go
9 off the record while he finds it.

10 (Pause in proceedings.)

11 PRESIDING OFFICER SCOTT: Back on the
12 record.

13 Mr. Ward, why don't you ask that
14 last question again, now that we're back on the
15 record.

16 DR. WARD: I've forgotten what the
17 question was.

18 PRESIDING OFFICER SCOTT: Do you
19 remember what the question was?

20 BY DR. WARD:

21 Q. Oh, what are the factors that are in there?
22 Which thing have you got? Okay. I'm now
23 looking -- yes, I have a copy now in front of
24 me. I'm looking at Table 7-2, Table 7-1 and 2.

1 A. So, Table 7-1 has the sound power level
2 information for the Siemens 3.2-113 wind
3 turbine proposed for this project. As you can
4 see, it's a function of wind speed. You know,
5 as wind speed increases up to a point, the
6 sound levels increase. Once it reaches a
7 certain wind speed, the sound levels level up.
8 So, that sound power level information is one
9 of the first key inputs to the standard to the
10 model. From there, you're then going to
11 attenuate that or diminish that by distance.
12 As I said a few minutes ago, these are the two
13 key things. The rest of it is just a little
14 bit of rounding, if you will, frankly. But
15 you're going to --

16 Q. A little bit of what?

17 A. It's a small difference, a small bit of
18 rounding, if you will. The sound power level
19 and the drop-off with distance, or
20 hemispherical divergence as you move away from
21 the source, diminishes the sound. That's
22 another key part of the model. And then
23 there's also a diminution of sound through
24 ground attenuation, through atmospheric

1 absorption, temperature and humidity factors.
2 Again, they play a small factor in that. But
3 those are some of the things that can come into
4 play. But it's really the sound power level
5 and the distance which are the two major items,
6 if you will.

7 Q. So you don't need a model. You just need to be
8 able to take actual measurements and adjust
9 those for these differences.

10 A. You could with a series of spreadsheets. Or if
11 you really want some hand calculations, you
12 could replicate the model. I would suggest
13 it's an awful lot of work, but you could do it,
14 yes.

15 Q. Is there any reason -- so, yes. I'm sorry.
16 Let me change that question.

17 So, your main reason for continuing to use
18 this model is that it's easier.

19 A. Well, the reason we use the ISO 9613 standards
20 is it's required by rule.

21 Q. No, I understand that. But it doesn't say --
22 where does it say you have to -- I stand
23 corrected. Okay.

24 Okay. So let's turn now to ISO 9613. And

1 let me get this back to whoever I got this
2 from.

3 In your supplemental testimony, to say the
4 least, you were critical of Ms. Linowes and
5 Mr. James' testimony. And it seemed to hinge,
6 as much as anything else, on a definitional
7 problem. And perhaps you can explain it to me.
8 There, on Page 3, Line 23, you say there's a
9 difference between the estimated accuracy
10 parameter and your correction, and you're
11 making quite a deal about the fact that the two
12 are not the same.

13 If I have an estimated accuracy parameter,
14 I would automatically put in -- put that in as
15 a correction. So, enlighten me as to why you
16 made a deal about it.

17 A. Sure. So there's a couple points here. Again,
18 if you read Section 9, or Clause 9 of the
19 standard, it discusses the, it's called
20 "Accuracy and Limitations of the Method," this
21 ISO propagation method.

22 Q. Right.

23 A. It's not a correction factor. It gives you
24 accuracy. And it's pretty clear in there.

1 It's very clear, actually, how it applies and
2 to what it applies to. It applies to only
3 sources that are no more than 30 meters high,
4 which is about 98 feet. These wind turbines
5 are obviously much taller than that. And it
6 applies to -- it gives some different numbers
7 in there, some different accuracy numbers,
8 depending on your distance, but only up to
9 1,000 meters. So, beyond 1,000 meters it very
10 clearly says it does not apply. So it would be
11 improper, actually, to take that accuracy and
12 try to ascribe some level of accuracy to the
13 calculations because the standard's pretty
14 clear that it doesn't apply.

15 Q. Well, I'm looking here in Clause 8, called
16 "Meteorological Correction," C, sub m-e-t.
17 Now, if you look at what Cmet equals, it's
18 quite obvious that for anything at a reasonable
19 distance, Cmet equals C zero. And then we go
20 down to C zero, and it says it is a factor in
21 decibels which depends on local meteorological
22 statistics for wind speed and direction and
23 temperature gradients. Can you tell me what
24 that dependence is?

1 A. Sure. So we're not talking about Clause 9
2 anymore, but now we're on Clause 8.

3 Q. Correct.

4 A. The Cmet item in there is -- really, it's
5 intended for long-term sound-level
6 calculations. So, in other words, if you're
7 trying to estimate what the sound levels might
8 be over the course of a month or a year, you
9 could look at the long-term meteorology of the
10 area and then apply that correction. It is
11 going to always reduce the sound levels. So we
12 do not apply that. What we're trying to do
13 here is calculate relatively short-term,
14 worst-case sound levels. So we do not apply
15 any correction. The Cmet is zero.

16 Q. Well, if there is a correction which needs to
17 be applied to the long term because of, and
18 I'll quote, "local meteorological statistics or
19 wind speed and direction and temperature
20 gradients," why wouldn't it apply to each
21 member of the series going into the average,
22 the long-term average?

23 A. Couple reasons. One, for example, if you're
24 going to apply it long term, the wind doesn't

1 blow all the time, and certainly doesn't blow
2 at the maximum sound level all the time. So as
3 we showed you there in Table 7-1, for example,
4 you need certain wind speeds to get the highest
5 sound levels. Those wind speeds don't exist
6 all the time, clearly; so, the sound level is
7 going to be less than that some of the time.
8 What we're trying to do here in the modeling
9 for the SEC Application is to calculate what
10 the worst-case sound levels are going to be
11 over a relatively short period of time. So
12 we're assuming worst-case directions,
13 worst-case wind speeds, et cetera. If you want
14 to look at a long-term correction, the sound
15 level is going to be lower.

16 Q. Well, if I, for example, go back to -- let's
17 back up a little bit on Clause 8. It's talking
18 about -- this is part of the problem we have
19 with this ISO thing. It says, "Meteorological
20 conditions which are favorable for propagation
21 from the sound source to the receiver as
22 described in Clause 5..." Well, when we go
23 back to Clause 5, we see that it has some
24 wordage in here, and I'll just quote a little

1 bit of it. Talking about -- it's Clause 5,
2 entitled "Meteorological Conditions." And it
3 says, "Downward propagation conditions for the
4 methods specified in this part are as specified
5 in 5.4.3.3 of ISO 1996-2 [sic], namely" -- if I
6 haven't lost you, then go on... it says wind
7 direction within an angle -- obviously, that
8 would make a difference -- and the dominant
9 source and the center of the specified receiver
10 being within the region from the wind blowing
11 into the source. And then it says, which is
12 the classic end of it, "These equations also
13 hold equivocally for average propagation under
14 a well-developed, moderate, ground-based
15 temperature inversion, such as commonly occurs
16 on clear, calm nights."

17 It is true that temperature inversions --
18 but they're more than a common occurrence.
19 They occur almost every single night. The only
20 question really is how deep they are and how
21 strong they are. So that certainly doesn't
22 describe anything near the worst case for sound
23 propagation.

24 PRESIDING OFFICER SCOTT: You're

1 going to get to a question; right?

2 DR. WARD: I'm getting to it.

3 BY DR. WARD:

4 Q. Can you define "worst-case"?

5 A. The worst case is in the Application. The
6 worst-case conditions are modeled in the
7 Application. The maximum sound level -- again,
8 we can go through the nuts and bolts of the ISO
9 standard. Frankly, it ultimately doesn't
10 matter because we are required to use it.
11 That's what we're using, and that's what we're
12 required to use --

13 Q. I understand that.

14 A. Okay. Let me finish. So, for example, the
15 wind direction aspect of it -- so, you know,
16 the wind farm has nine wind turbines up on the
17 ridge; right? The standard by rule assumes
18 that the wind is blowing from each of those
19 turbines to a receptor -- I didn't say that
20 very well.

21 So, pick a receptor that's to the west of
22 the wind farm, due west. The standard assumes
23 the wind is blowing from a turbine directly to
24 that receptor at the same time. So, if Turbine

1 9 is maybe more south or southwest of a house,
2 it says you've got to -- I'm sorry --
3 southeast, you've got a southeast wind coming
4 at it, Turbine 5 might have to have an east
5 wind to go to that receptor. And for Turbine 1
6 up at the top of the string, you need a
7 northeast wind to blow from that turbine to the
8 house. That's what the standard requires, even
9 though we know in reality you're not going to
10 get a northeast wind, an east wind and a
11 southeast wind all at the same time. It's
12 saying you're going to take the sound from each
13 of those nine sources and propagate it,
14 assuming that receptor is directly downwind.
15 That's what they mean by the "propagation
16 standard." Again, that's part of the
17 conservatism of the model.

18 Q. Let me go back now to the thing I brought up
19 earlier, which was at Page 3, Line 23, which
20 was where you are drawing a very fine line
21 between the estimated accuracy parameter and
22 the correction. And you agree that there's an
23 estimated accuracy parameter, but it doesn't
24 require a correction; they both seem to be

1 3 decibels. Why are they in the last section
2 of ISO 9613-2 under a rubric called "Accuracy
3 and Limitations of the Method," quote, unquote,
4 if they're not intended to be accounted for?

5 A. Well, I didn't say they're not intended to be
6 accounted for, ever. I'm just saying not in
7 this specific application. In other words, if
8 you have a situation in another project that
9 meets the definition of the height and the
10 distance, then you could apply those accuracy
11 estimates to your calculations.

12 Q. I don't know. I understand English, but I
13 don't understand what you said.

14 This was, as we agreed, supposed to -- you
15 were supposed to do this according to ISO
16 9613-2. And now you're saying to me that this
17 thing about accuracy and limitations of the
18 method doesn't apply to this. Somehow
19 something's missing here. Maybe I'm dense, but
20 I have to ask the question.

21 A. Well, so this Clause 9 is in the standard. But
22 as I said, it would be improper to apply it to
23 this specific project, or really any wind
24 project, because if you read --

1 Q. Can you repeat what you just said?

2 A. It would be improper to apply that clause to
3 this project because the source does not meet
4 the very specific definitions in there.

5 Q. Does it meet the definition of anything?

6 Accuracy and limitations of the method, are
7 there any accuracies and limitations of the
8 method that apply to Antrim Wind?

9 A. So, the uncertainty is required, as we talked
10 about earlier, the K factor from the turbine
11 manufacturer. That's required and that's been
12 included. There are no other uncertainties
13 that apply to this project. I guess my best
14 way to answer that, this is not an uncertainty;
15 it's an accuracy to the method. We have
16 measured many, many real-world projects and
17 found that there is no reason to add this
18 additional 3 decibels, even if it did meet the
19 definitions of height and distance. And I talk
20 about in here the real-world testing done on
21 Stetson 1 in Maine, where they did add
22 3 decibels to it, and their modeling numbers
23 were 4 decibels too high. They over-predicted
24 by 4 decibels because they added so much

1 conservatism. There's no need to do that.

2 There's no reason to do that.

3 Q. Well, we've heard this a lot, not just from
4 you, Mr. O'Neal, but from other people from
5 Antrim Wind. And we keep going back to somehow
6 or other the real world has just verified we
7 were better than -- we're better than the
8 virgin, for all practical purposes.

9 I don't have any data on that. I don't
10 know of any that's been presented that would
11 verify that. You're quoting from something. I
12 wouldn't even know where to find it if I were
13 trying to find it. In other words, what you're
14 saying is that the whole concept of accuracy
15 and limitations of the model, which the model
16 talks about having accuracy limitation,
17 accuracy limitations, you're saying, doesn't
18 apply. In other words, there are no
19 uncertainties just in the way the thing is
20 calculated. Is that -- am I reading that
21 correct?

22 MR. NEEDLEMAN: Mr. Chair, I'm going
23 to object at this point. I think we've been
24 over this and over it. And I think Mr. O'Neal

1 has explained it repeatedly.

2 DR. WARD: I can't hear you, Barry.

3 MR. NEEDLEMAN: I'm sorry. I was
4 saying I'm going to object. I think we've been
5 over this repeatedly at this point. Mr. O'Neal
6 has explained this issue now.

7 MR. RICHARDSON: I think we're also
8 bordering on just argument at this point. It's
9 not really asking questions of the witness.
10 It's argument.

11 PRESIDING OFFICER SCOTT: How close
12 are you, Mr. Ward?

13 DR. WARD: If we're not going to
14 argue meteorology now, then we might as well
15 close this hearing down, as far as I'm
16 concerned.

17 PRESIDING OFFICER SCOTT: Well, I
18 think you're talking of the model, I think.
19 But how close are you to finishing?

20 MR. WARD: I haven't even started.
21 I'm just on noise, and I got three or four
22 other things to go.

23 PRESIDING OFFICER SCOTT: Okay. So I
24 think we've exhausted the model, at least from

1 my view. So unless you have a very specific
2 question on the model, I'd ask you to move on.

3 BY DR. WARD:

4 A. On Page 4, Line 20 of your supplemental
5 testimony, again you draw a distinction between
6 "correction" and "accuracy" of ISO 9613-2. If
7 there is an accuracy problem, you're saying
8 that doesn't require a correction.

9 MR. NEEDLEMAN: I think this is
10 exactly the same --

11 BY DR. WARD:

12 Q. I'm sorry. Is that true?

13 PRESIDING OFFICER SCOTT: Maybe you
14 can give a "Yes" or "No" answer.

15 WITNESS O'NEAL: It's the same
16 question we've already been around.

17 PRESIDING OFFICER SCOTT: That's good
18 enough. So, Mr. Ward, again, I think the
19 witness has answered your question on this.

20 DR. WARD: Well, yeah, but -- okay.

21 BY DR. WARD:

22 Q. On Page 5, Line 9, 3 decibels appears again,
23 which you use this time to buttress your
24 argument. So, which way is it?

1 MR. NEEDLEMAN: Same objection.

2 PRESIDING OFFICER SCOTT: Yeah, I
3 think we've exhausted the "3 decibels" issue.
4 If you could move on, I'd appreciate that.

5 MR. WARD: Well, I wouldn't.

6 PRESIDING OFFICER SCOTT: Well, I'm
7 asking you to.

8 BY DR. WARD:

9 Q. Mr. O'Neal, do you want to leave it with the
10 Committee that there is no correction that
11 needs to be applied to the results of your
12 thing with using 9613-2?

13 A. Yes, I'm leaving it as it is. The assumptions
14 in the model, the uncertainty included from the
15 manufacturer, the conservatism assumptions that
16 we've made have all been borne out in reality.
17 There's plenty of papers we have submitted as
18 part of this process that explain that and show
19 the measurements. So, yes, I'm very
20 comfortable in that.

21 Q. Okay. Let's move on to another factor, the
22 factor G, the sound absorption of the ground.

23 Now, on Page 6, Line 10 and following, and
24 particularly Line 22. If ice has a G of zero,

1 then what is the G for snow surface with an ice
2 coat on top?

3 A. So, again, let me preface this by saying the G
4 factor part of this whole modeling exercise is
5 a very, I won't say trivial, but a very small
6 piece of the answer. So let's start with that,
7 okay. It is not a very significant piece of
8 it. That said, again, all the research is
9 borne out. There's a research paper that's
10 been submitted as part of the record. The
11 Mass. CEC research paper has shown again and
12 again that a G factor of .5, which represents a
13 mix of porous and hard ground, plus the 2
14 decibel conservatism for the uncertainty from
15 the turbines, is very accurate in calculating
16 the results.

17 Q. So, whether you use a G of 0 or G of 1, it
18 doesn't make a hell of a lot of difference. Is
19 that what you're --

20 A. It makes a small difference.

21 Q. How much --

22 A. But what I'm saying is a G of .5 we found to be
23 most accurate.

24 Q. How much of a difference is there between zero

1 and one? Let's take somebody who's at, let's
2 say, 35 or 40. Pick something in the middle.
3 How much of a difference would there be in your
4 model between a G of zero and a G of 1?

5 A. I mean, you're asking me a hypothetical
6 question?

7 Q. No. I'm asking how many dB. I don't have to
8 have the exact number. Is it 1? Is it 10? Is
9 it 100? I don't know.

10 A. Right. So it's about 3 to 6 decibels if you go
11 all the way from zero to 1.

12 Q. Three to 6 dB.

13 A. Yeah.

14 Q. Would you agree that a snow surface with an ice
15 coat on it would be much closer to zero than a
16 1? I won't require a zero exactly, but let's
17 say most of the way.

18 A. If you had a wide-open lake, take Lake
19 Winnepesaukee, all covered with ice, that would
20 be a hard, reflective surface. That could be a
21 G of zero.

22 Q. And so you put some -- if you intersperse some
23 trees on it, how much does it reduce?

24 A. So I guess what I'm saying is we're in Antrim.

1 This project is in Antrim. We're looking at
2 generally a vegetative cover, forested cover.
3 The standard's very clear that for that you
4 could use a G equals 1. We don't do that. We
5 use a G of .5, mixed surfaces, some hard, some
6 soft. Again, we found that to be very
7 accurate.

8 Q. Well, I have a -- I sit in the -- my house sits
9 in the middle of a forested area with lots of
10 growth and small trees and shrubs and things
11 like that. In long stretches of the winter,
12 the snow covers almost all of it. And I have
13 some weather data I can present to you if you
14 need that shows that there will be long
15 stretches when the ice -- or when the snow
16 surface will have been wet from freezing rain
17 or otherwise, solar melting, whatever it is,
18 and then refrozen. And when I look out -- and
19 this is a big, forested area -- I see mostly
20 ice. And I'm looking at this and saying, jeez,
21 Antrim is interesting because we're getting a
22 lot of those kinds of days every winter. Going
23 through weather data, for example, I don't know
24 how you would estimate how many days do you

1 think in Antrim there would be a significant
2 snow cover in the winter.

3 A. I don't know.

4 Q. If I told you a hundred, you wouldn't disagree?

5 A. I would say it's irrelevant for what we're
6 trying to do right now.

7 Q. I'm trying to get at the G factor which makes
8 it, as you already say, a difference of 3 to 6
9 dB. And that kind of a surface is going to
10 exist for many days every winter in Antrim.
11 Now, does that become -- is that irrelevant, or
12 are they going to shut down for those days?

13 A. I guess maybe one way to help answer the
14 question is, for example, we did wintertime
15 post-construction compliance testing at the
16 Groton Wind Farm here in New Hampshire under
17 snow and ice-covered conditions. And the sound
18 levels were less than what we modeled.

19 Q. Well, that starts to sound like you're using a
20 model which puts in a factor which is
21 irrelevant.

22 DR. WARD: Let the record show that
23 the witness appears to question my comment. So
24 let me ask --

1 PRESIDING OFFICER SCOTT: I don't
2 think that was a question, Mr. Ward, was it?

3 MR. WARD: Pardon?

4 PRESIDING OFFICER SCOTT: I don't
5 think you asked him a question, did you?

6 MR. WARD: No, I didn't.

7 PRESIDING OFFICER SCOTT: Okay.

8 BY DR. WARD:

9 Q. Are you saying that the G factor basically is
10 irrelevant?

11 A. I'm saying a G factor of .5 does a good job of
12 representing the types of conditions that
13 you're going to experience. Frankly, at the
14 end of the day, the Project is going to have to
15 do post-construction compliance testing in all
16 seasons, and they're going to have to
17 demonstrate that they meet those limits. And
18 if they don't, they'll have to change it. They
19 will have to rectify it. We're confident
20 they're going to meet those limits.

21 Q. Well, that's always used as an excuse. I've
22 never seen anything closed down. So I'm kind
23 of skeptical about that. But I'll go back to
24 my question.

1 There's an uncertainty in the G factor,
2 which you state is between 3 and 6 decibels. I
3 don't know whether it is or not because I don't
4 have the model. But taking that as an
5 uncertainty, you're saying that it doesn't make
6 that much difference as a practical matter
7 because the G doesn't vary that much. Is that
8 the way you want to leave it?

9 A. Using the G factor that we used for the
10 Application, I'm saying that's correct. We're
11 comfortable leaving it the way it is.

12 Q. No, you're putting in a factor of one-half.

13 A. Point five. Correct.

14 Q. And you're saying that will take care of it?

15 A. Yes.

16 Q. And there isn't an uncertainty in that, or
17 enough to bother with --

18 (Court Reporter interrupts.)

19 A. Again, we followed the model, the appropriate
20 guidance, and we're confident in the answer.
21 I'll leave it at that.

22 Q. Well, you don't follow the model. You put
23 things into the model which you, for various
24 reasons -- all of which might be fine. You

1 can't use the model as the excuse. You have to
2 say that you put certain factors into it.
3 That's what I'm trying to find out. You put in
4 a factor of .5. And as far as you're
5 concerned, there doesn't have to be any
6 uncertainty in that.

7 MR. NEEDLEMAN: I'm going to object.
8 I think the witness has answered this question.

9 PRESIDING OFFICER SCOTT: Can you
10 move on, Mr. Ward?

11 BY DR. WARD:

12 Q. On Page 7, Line 18, you omit the comment in the
13 same table, quoting, These estimates have been
14 made from situations where there are no effects
15 due to reflection... does your same answer
16 apply to that?

17 A. I'm sorry. Where are you?

18 DR. WARD: On Page 7, Line 18 of his
19 supplemental testimony. I'm sorry. Wait a
20 minute. Yeah, Page 7, Line 18.

21 BY DR. WARD:

22 Q. You omit the comment in the same table that you
23 apply to. The table says, quote, These
24 estimates have been made from situations where

1 there are no effects due to reflections,
2 unquote.

3 MR. NEEDLEMAN: I'm sorry. I'm not
4 following where you are.

5 BY DR. WARD:

6 Q. Page 7 of your testimony, Line 18 --

7 MR. NEEDLEMAN: Are you looking at --

8 BY DR. WARD:

9 Q. Now, you're --

10 (Court Reporter interrupts.)

11 MR. NEEDLEMAN: Are you looking at
12 Applicant's Exhibit 21?

13 MR. WARD: Whatever you referred to
14 in that table. I can find it if you need me
15 to.

16 MR. NEEDLEMAN: I just want to know
17 which testimony you're on.

18 PRESIDING OFFICER SCOTT: It would be
19 helpful, Mr. Ward, 'cause at least this member
20 of the Committee doesn't know where you are
21 either. So we'd like to follow along.

22 MR. IACOPINO: Which document are you
23 in?

24 MR. WARD: I'm referring to, if you

1 go to Page 7, Line 18, you refer to a table in
2 ISO 9613-2. I'll have to find out what that
3 table is because now I'm looking through your
4 testimony. Hold on.

5 (Pause in proceedings.)

6 PRESIDING OFFICER SCOTT: Why don't
7 we go off the record. Why don't we take a
8 five-minute break while we're doing that also.

9 (Whereupon a brief recess was taken.)

10 PRESIDING OFFICER SCOTT: Okay.
11 We'll go back on the record.

12 Mr. Ward, I think you were going
13 to go to the next question you had.

14 MR. WARD: I've given up on that
15 question. There's too much paper. I just have
16 a couple more questions on noise, and then we
17 can move on.

18 BY DR. WARD:

19 Q. In ISO 9613-2, Clause 9, the first paragraph,
20 it says, "Restricting attention to moderate
21 downwind conditions of propagation as specified
22 in Clause 5 limits the effect of variable
23 meteorological conditions on attenuation to
24 reasonable values." I assume "reasonable"

1 means not large. And if we go over to Clause
2 5, the last sentence in it says, "The equations
3 also hold equivocally for average propagation
4 under well-developed, ground-based inversions,
5 such as commonly occur on clear, calm nights."

6 Now, despite those things, you want to
7 leave it with the Committee that there is no
8 required correction for these limitations.

9 A. Again, we're confident of the numbers as
10 they're presented in the Application, yes.

11 Q. Thank you.

12 I'd like to turn now -- do you know what
13 the term "ducting" means?

14 A. I've heard of it.

15 Q. D-U-C-T-I-N-G, like an air duct or whatever.
16 "Ducting", do you know what that means in a
17 meteorological sense?

18 A. I have a general idea.

19 Q. If I were to read you out of the Glossary of
20 Meteorology, published by the American
21 Meteorological Society, I'll quote it now -- I
22 can show it to anybody if they want it --
23 "Duct: Applied to the atmosphere and ocean,
24 any region with vertically varying properties,

1 such that waves of any kind, electromagnetic
2 and acoustic, launched in certain directions
3 are guided by or trapped within the region
4 rather than propagating radially from their
5 source." Does that help you understand what
6 "ducting" is?

7 A. Yes.

8 Q. Okay. Now, what would you consider favorable
9 meteorological conditions at which ducting
10 would occur?

11 A. Again, I'm not sure how that applies to what
12 we're doing here. The standard is clear about
13 the temperature inversion conditions. It's a
14 downwind condition. You know, that's all part
15 of the standard, so that's what the modeling
16 takes into consideration. That's what it uses
17 as part of the ISO standard. So I'm not sure
18 how ducting is relevant to doing these
19 calculations.

20 Q. Would you care to make an estimate of how much
21 difference it might make between a night with
22 ducting and a night without ducting, as far as
23 the propagation of sound from a noise source
24 might have?

1 A. I mean, the sound levels for these types of
2 sources are driven largely by the direct path
3 of propagation -- in other words, sounds coming
4 from the wind turbine directly to a home, for
5 example. That's the shortest line, the
6 straightest line, and that's what's used in the
7 calculations to calculate the sound levels from
8 the source to the receptor.

9 There is the feature in the model that
10 allows for reflections as well, if there are
11 other surfaces in addition to that, that can
12 cause the sound wave to reflect off something
13 and then go to the receptor as a second source,
14 if you will. Those are taken into account, as
15 well, as part of the calculation.

16 Q. You may not be old enough to be aware of the
17 fact that our Navy ships back in World War
18 II -- I don't know whether it's still true or
19 not -- they had a fall-back communication
20 system which were called "sound tubes." They
21 were basically a duct, and you could whisper in
22 one end, and 100 feet away you could hear it
23 clear as a bell. If I were to, for example,
24 holler up into one of these ducts, I wouldn't

1 have to holler. I could speak softly, and
2 anybody anywhere near the duct, on any end of
3 it opened, would be able to hear me very
4 clearly. So, ducting can, in an extreme case,
5 carry sound long, long distances, 10 or 100
6 times the distance you can get without them.
7 So, ducting is not a -- well, I should ask the
8 question. I'm sorry.

9 How much difference would it make between,
10 for the same conditions otherwise, same wind
11 conditions, the difference between a
12 temperature inversion at night and a regular
13 situation where it would be warmer at the
14 bottom and cooler at the top? How much further
15 might a sound of a certain level travel?

16 A. Typically when you don't have temperature
17 inversion conditions, the sound levels are
18 lower.

19 Q. By how much?

20 A. Depends on the distances involved. I can't
21 give you a one-number answer. But they will be
22 lower.

23 Q. Well, let's take 1,000 feet. Would you give me
24 a number for that?

1 A. I can't predict that, off the top of my head.
2 I don't know.

3 Q. Oh, if you don't know that, would you concede
4 it could be as much as 10 dB?

5 A. Well, again, I said if you don't have a
6 temperature inversion -- in other words, if the
7 air is well mixed, then the sound levels are
8 lower than what we have in the Application. So
9 we're even further below the SEC limit of 40
10 decibels. So I guess I'm not that concerned.

11 Q. Well, I wasn't concerned about the non-
12 inversion ones. I'm talking about times when
13 there's a good, strong inversion and we have
14 what's called "ducting." Everybody -- I'm
15 sorry. It's well known in meteorology that
16 there is a thing called "ducting." When we
17 take electromagnetic waves, like radar waves
18 and things like that, ducting can carry sound
19 10 or 100 times the distance it does without
20 it. Typically, over the ocean where you might
21 have some cool water and warm air moving over
22 it, you get all kinds of spurious reflections
23 from long distances. Sound is -- operates the
24 same way. There's no question. I don't --

1 well, I shouldn't say that.

2 Do you believe that ducting, when it's
3 there, would carry sound significantly further
4 than where there isn't?

5 A. There can be atmospheric conditions certainly
6 that will cause sound to propagate out further.
7 It doesn't mean it's going to be louder at
8 those closer-in locations, however.

9 Q. What does that mean? If it carries out
10 further, it's got to be louder at the same
11 distance.

12 A. No. There can be reflections off the
13 atmosphere for those further-away distances. I
14 guess, you know, this concept of ducting I
15 would suggest is -- it's a real meteorological
16 condition. I have the same AMS dictionary in
17 my office. I know what you're talking about.
18 I guess I would say it's really not germane or
19 relevant to what we're trying to do here.

20 Q. Well, let me suggest that we're talking about
21 nighttime. And it says in various places that
22 we have inversions, temperature inversions at
23 night. I would say almost every night. But
24 some people would disagree. Do you know

1 what -- how the temperature inversion works to
2 confine the sound?

3 A. So, again, the ISO 9613 standard is predicated
4 on there being, as you read earlier, a
5 well-developed nighttime temperature inversion.
6 That is -- that basically backs up the
7 calculations. They're valid under those types
8 of conditions, which, as you said, can be kind
9 of a worst case. So I guess I'm not following
10 why you're asking me that, because the model
11 assumes a temperature inversion already, and
12 that's what we used.

13 Q. Well, I need to -- the reason I'm following it
14 up as a way of explanation is that I'm trying
15 to get a number as to how much difference this
16 makes. We have been arguing about it. You
17 keep saying the model is perfect, the model is
18 perfect. And it may be. I assume every
19 model -- and every model I ever met in
20 meteorology has an uncertainty. And so I'm
21 trying to get at how much difference it makes.
22 And the quote that you quoted and that I quoted
23 is "a well-developed inversion." Well, there
24 are well-developed inversions most nights. And

1 it's well known, for example, that the
2 windmills are noisiest at night. So we're not
3 talking about an irrelevancy. I'm trying to
4 get out of you, if we -- first of all, let's
5 start.

6 How does it work, such that a temperature
7 inversion will make sound carry further? I'm
8 sorry. Would you agree that a temperature
9 inversion would have sound carry further?

10 A. Yes.

11 Q. Okay. How does that work?

12 A. By the sound -- it's due to the temperature
13 gradients in the atmosphere. The sound can
14 refract off the -- sound waves basically bend
15 back down to earth.

16 Q. Why?

17 A. Because of the temperature gradient.

18 Q. The temperature causes --

19 A. And also winds, too. If you have wind shear,
20 it can also bend the sound waves back down to
21 earth.

22 Q. Do you know how fast the speed of sound is?

23 A. I do. It depends on temperature a little bit.
24 But it's approximately 750 miles per hour.

1 Q. I always use five seconds for a mile. But
2 whatever that comes out to. Okay.

3 So a night on which we had a
4 well-developed temperature inversion, we're
5 going to get louder sounds at the same distance
6 or the same sounds at longer distances; is that
7 correct?

8 A. The sound levels we're going to get are in the
9 report. That's what -- they're in there. The
10 standard assumes a nighttime temperature
11 inversion. That's how the calculations were
12 done, and those numbers are in the report.
13 Those are the numbers that are going to happen.

14 Q. And so, depending on how strong the temperature
15 inversion was, it might be higher or lower?

16 A. As I started to say earlier -- and if I
17 misunderstood your question, I'm sorry. If
18 there's weak or no temperature inversion, then
19 the sound levels are going to be lower.

20 Q. Well, then how about a not-so-strong
21 temperature inversion? Are they going to be
22 lower?

23 A. I don't have a way to quantify for you degrees
24 of temperature inversion.

1 Q. So we agree that temperature inversions will
2 affect the sound carried, but we don't seem to
3 have any agreement on stronger inversions would
4 do more than or lesser inversions, or no
5 inversions at all. Or maybe I'm
6 misinterpreting that. Let me ask the question.

7 Would the distance and the intensity to
8 which sound carries be dependent on the
9 strength of the inversion, all other things
10 being equal?

11 A. I'm going to come back to the standard again,
12 because between using the standard, verifying
13 in the field under temperature-inversion
14 conditions where I have measured
15 post-construction, the numbers bear out the ISO
16 9613 modeling.

17 Q. Well, I keep getting that as an answer, and I
18 have no way of verifying it and either agreeing
19 or disagreeing.

20 Let me ask a very simple question. From
21 those numbers, from your analysis from your
22 training and everything in meteorology, would
23 the strength of the inversion affect the
24 distance and/or the intensity of the sound?

1 A. Not materially. Again, it's the distance, the
2 straight-line distance for propagation, as I
3 said earlier in our conversation, that's going
4 to dominate the answer.

5 Q. So you would be surprised if it were a factor
6 of 10.

7 A. I would be very surprised, yes.

8 Q. Okay. So you agree that there's a little
9 difference in it, but nothing much.

10 A. I guess I'm not sure how many ways I can say
11 the same thing.

12 Q. Okay. I'm sorry. Let me ask the question
13 properly.

14 We get back to your criticism of both Ms.
15 Linowes and Mr. James about that 3 dB. Now,
16 what you're saying -- or I'm sorry.

17 How much difference might it make -- you
18 just said -- how many dB might you put on the
19 outside number on how much difference between a
20 weak, but well-developed temperature inversion,
21 and a strong temperature inversion? How many
22 dB?

23 A. I'm going to answer that with looking at Page 5
24 of my supplemental testimony. It says

1 "Appendix 21." I don't know if that helps
2 people.

3 Q. I have 5, Table 1. This in your supplemental
4 testimony?

5 A. That's correct. Page 5.

6 Q. Yeah.

7 A. So, these are the actual measured sound levels
8 for a ridgeline wind farm in Maine called
9 "Stetson 1." Table 1 shows the
10 pre-construction model sound level, 45.5. Do
11 you see that?

12 Q. Yes.

13 A. They added the manufacturer's uncertainty --

14 Q. Is this the ISO 9613-2 model?

15 A. Yes. Yes, they use the 9613-2 model --

16 Q. All right.

17 A. -- with a G factor of .5.

18 Q. Hmm-hmm.

19 A. They added the K factor, the turbine
20 manufacturer's uncertainty, of plus 2. They
21 added another plus 3 for the accuracy, and they
22 came up with a total pre-construction
23 uncertainty accuracy estimate of 50.5. Do you
24 see that?

1 Q. I see that.

2 A. They went out and measured in the real world
3 when the turbines were up and operating under a
4 strong temperature inversion. They measured
5 46.5. So, the model with all those layers of
6 uncertainty, the uncertainty plus the accuracy
7 estimate, which I suggest is not appropriate,
8 they were over by 4 decibels. So they were not
9 very accurate.

10 Table 2 shows you what it would have been
11 without the plus 3 factor, this accuracy
12 estimate we've been talking about from Clause 9
13 of the standard. So, with that --

14 Q. I thought you said that didn't apply.

15 A. That's right. I didn't do this modeling. So
16 I -- they threw it in. I'm just showing you by
17 way of example.

18 So if you just take the model number out
19 of ISO 9613-2 of 45.5 with a G factor of .5,
20 add the uncertainty, they got 47.5 under strong
21 temperature inversion, and then they measured.
22 That was still a decibel higher than what they
23 measured in the real world under a strong
24 temperature inversion. By way of -- I'm just

1 going through that to try to answer the
2 question about why, under a temperature
3 inversion, the modeling is supported by
4 reality.

5 Q. Well, I can't really respond to anything like
6 that because it doesn't say, first of all, what
7 the temperature inversion was. And it doesn't
8 talk -- this is presumably an average of
9 something. I don't know what you're averaging.
10 If I were doing this and taking nights -- and
11 I'm not saying -- if I had a night temperature,
12 I would look at the -- as the thing develops --
13 a temperature inversion doesn't happen
14 overnight; it develops during the night. Now,
15 I don't know whether these numbers were taken
16 early in the evening, late in the evening, just
17 before dawn, whether they were all averaged. I
18 have no way of judging what this temperature
19 inversion was. So, perhaps you could explain
20 to me how you can use this and respond to the
21 question I asked, which is: Does it change
22 that much with the temperature inversion, and
23 if so, by how much?

24 A. I can't tell you exactly what time these data

1 were collected.

2 Q. I don't need that.

3 A. I don't know. I can't tell you that. This is
4 part of a state-required compliance test up in
5 Maine, where they have pretty stringent
6 conditions in terms of low winds at the ground,
7 strong winds up at hub height, so, you know, a
8 strong wind shear case. These were the
9 results.

10 Q. Well, the strong wind shear ones, other than
11 affecting the initial output of noise, had a
12 relatively minor affect on the propagation
13 compared to the temperature measurements. And
14 I can't tell from this how much difference it
15 makes.

16 And I guess I'll go back to the question.
17 And if you don't know the answer, you can
18 perfectly say that. How much difference would
19 there be from a night with an average
20 well-developed temperature inversion to a night
21 with a very well-developed temperature
22 inversion, and particularly toward the early
23 morning hours?

24 A. I can't answer that question.

1 Q. Okay. I'm not asking you for numbers you don't
2 know.

3 Okay. So you would agree that there's
4 what's called in the meteorological glossaries,
5 "ducting." There are such things where
6 temperature inversions -- I believe I read the
7 thing earlier. But you don't know how much of
8 an effect that would have on the sound
9 measurements.

10 A. I do not believe it's going to have any type of
11 material effect on the residents that are
12 closest to the wind farm for compliance
13 purposes.

14 Q. That's an interesting answer.

15 PRESIDING OFFICER SCOTT: Hold on a
16 second. Mr. Berwick, do you have a question?

17 MR. BERWICK: I just wanted to cite a
18 fact from our house, if I could, about ducting.

19 PRESIDING OFFICER SCOTT: You won't
20 be able to testify -- I mean, there will be
21 other testimony later --

22 MR. BERWICK: Oh, okay. All right.

23 BY DR. WARD:

24 Q. Okay. I would like to now move on to shadow

1 flicker. There was a shadow flicker model,
2 which I assume is mostly astronomical and
3 geometrical or whatever with some
4 meteorological factors put in. Now, I think
5 earlier we discussed the numbers which were way
6 over 20, 30 hours per year. Way over the limit
7 of the possible astronomical maximum. I don't
8 know whether they're right or wrong. They seem
9 about the right area. And then there are
10 corrections put in, or adjustments or whatever
11 you want to call it, for real-world cloudiness.

12 Now, the use of the percent of total
13 sunshine is a very interesting parameter, since
14 it's totally unrelated to much of anything
15 having to do with whether you're going to see
16 the sun or not. And as a matter of fact, if I
17 go into the meteorological glossary, it talks
18 about the percentage of bright sunshine rather
19 than any sunshine. And I've been out many
20 times when the sun isn't bright and I get
21 shadows out of it. So I don't quite know at
22 what point the sun effect kicks in --

23 (Court Reporter interrupts.)

24 Q. So my question is: What was the rationale for

1 putting in a percentage of total bright
2 sunshine in the model as a substitute or
3 surrogate for the actual, which is how many
4 times do you get clouds in the way of the sun
5 when it's between -- when the turbine is
6 between you and the sun? Do you have any -- I
7 can't find out anything. Maybe you know.

8 A. I'm not a hundred percent sure I understand the
9 question you're asking. Can you say it again,
10 please?

11 Q. Well, let me back up slightly.

12 You would agree that the correction that
13 needs to be put in, or just astronomical,
14 correction, okay, has to do with whether you
15 can see the sun.

16 (Court Reporter interrupts.)

17 A. Right. Right. If there's no sun, there's no
18 shadow.

19 Q. You would agree with that. And that's the
20 correction you'd like to put in.

21 A. The correction we put in is what's appropriate
22 for the model, and that's percent of the time
23 that it's, you know, cloudy versus sunny.

24 So --

1 Q. But that isn't -- the percent of possible
2 bright sunshine is not the times when you --
3 when the sun would be behind the clouds. It's
4 not.

5 A. Okay. We agree to disagree then.

6 Q. But you don't think -- you think that the
7 percentage of possible sunshine actually is a
8 good measure of the correction for the fact
9 that you won't always see the sun when you're
10 looking at it.

11 A. I think it's a reasonable approximation. It's
12 one of many inputs in the model. It's
13 long-term data collected by, obviously, a
14 reputable agency, the National Weather Service.
15 So, yes, I think it's a valid input.

16 Q. If I were to show you some data that shows, for
17 example, that the cloudiness is different at
18 different times of the day, the day and night
19 and so forth, would that make any difference to
20 you, that the average for the day, or the total
21 for the day may or may not be the proper number
22 to use?

23 A. No, I don't think it would. I think I would
24 still rely upon the National Climatic Data

1 Center data.

2 Q. No, I have a lot of national data. I'm their
3 best customer. So I know that. And the data
4 are there. And I'm not doubting your data.
5 What I'm asking is why would you take the
6 percent of total sunshine as the correction
7 factor when you know bloody well -- I'm
8 sorry -- when you know as a meteorologist that
9 cloudiness varies by time of day?

10 A. Because the model -- you can't be so precise in
11 time that you know on -- pick a day -- May 14th
12 it's going to be cloudy from 8 a.m. to 11 a.m.
13 and then sunny from 11 a.m. to 2 p.m., and then
14 cloudy, et cetera. So it's much more
15 reasonable to go with long-term averages.
16 Sure, on a year-to-year basis it could vary
17 slightly from that. Absolutely. But this is a
18 very fair, defensible way to come up with a
19 calculated estimate of possible, possible
20 shadow flicker.

21 Q. Well, would you expect, for example, if you
22 were measuring percent of possible sunshine
23 that it would be very time-of-day dependent?

24 A. I'm not sure how to answer that question.

1 Q. Would you expect at different times of the day,
2 on average, that you would have more clouds
3 than at other times of the day, on average?

4 A. It's possible.

5 Q. You wouldn't agree that it's not only possible,
6 but true?

7 A. I guess I don't have the data in front of me.
8 I can't respond either way.

9 Q. Would you agree that we generally don't get fog
10 at noontime?

11 A. We generally don't get fog at noontime? That's
12 your question?

13 Q. Yeah. Would you agree that's a general
14 statement?

15 A. I'm not sure I can answer that question. I've
16 seen fog all times of the day, at night, in the
17 morning, during the day. I can't tell you
18 what's more prevalent or not. I don't know.

19 Q. I made it "generally," which meant that --
20 (Court Reporter interrupts.)

21 Q. My question was, while we can get fog at any
22 time, that does not answer my question, which
23 is: We seldom get fog in the middle of the
24 day; is that true?

1 MR. NEEDLEMAN: I'm going to object
2 on relevancy.

3 PRESIDING OFFICER SCOTT: Tell me
4 where you're going, Mr. Ward. I'm a little bit
5 concerned that --

6 MR. WARD: Well, I'm having
7 difficulty, in that Mr. O'Neal is going to
8 force me to give him a course in Meteorology
9 101, and I would hate to have to do that.

10 PRESIDING OFFICER SCOTT: My concern
11 is so far you've asked the same question in a
12 lot of your questioning in different ways,
13 expecting different answers.

14 DR. WARD: And I don't get an answer.

15 PRESIDING OFFICER SCOTT: Because you
16 don't like the answer doesn't mean it's not an
17 answer.

18 DR. WARD: That's not a fair summary
19 of what I -- of what's going on.

20 PRESIDING OFFICER SCOTT: Maybe you
21 can rephrase.

22 DR. WARD: Let me try a whole
23 different thing.

24 BY DR. WARD:

1 Q. Are there, in your experience and knowledge and
2 training -- from your knowledge and training
3 and experience, do we get potentially different
4 kinds of weather, on average, at different
5 times of the day?

6 A. Different types of weather? Again, I'm not
7 sure how that's relevant for shadow flicker.

8 Q. Well, would you agree that you generally don't
9 get fair-weather cumulus clouds in the middle
10 of the night?

11 A. Generally, yeah.

12 Q. You generally don't get them in the middle of
13 the night.

14 A. Right.

15 Q. Would you agree that we tend to have more
16 thunderstorms in the afternoons and evenings
17 that at other times of the day?

18 A. Generally.

19 Q. Would you agree that we get our most extreme
20 fogs generally late at night?

21 A. I can't answer that either way. I don't know.

22 Q. Okay. If we were to look at the shadow flicker
23 model, it's very precise for the time of day;
24 is it not?

1 A. It's very precise, yes.

2 Q. Very precise. Any day you would get -- you
3 would know it within two minutes or a minute.
4 We're not arguing about being hours. We're not
5 talking about it being, oh, yeah, sometime this
6 afternoon. It's very precise, 7 to 12-point
7 whatever it is. Is that true?

8 A. It's very precise, yes.

9 Q. Yeah. So we're talking about very precise
10 times of day when we're getting the possibility
11 of shadow flicker; is that not true?

12 A. That's true, yes.

13 Q. And the data are available to calculate -- I'm
14 sorry. I'll change the question.

15 Are there not data available from which
16 the cloudiness at specific times of day from
17 which the correction for cloudiness could be
18 calculated? Are the data available?

19 A. I don't know the answer to that. And I guess I
20 would say it still wouldn't change my opinion
21 about this because you're looking at sort of a
22 climatological average. You can't say that if
23 you use specific hourly data on cloudiness for
24 certain hours that it's always going to happen

1 at that time.

2 Q. There seems to be a contradiction in what you
3 say. You talk about "average" and then "at
4 times." Either one or the other applies. I
5 don't know which. But let me avoid that
6 question.

7 Let me just say this: Are there data
8 available from which you could calculate
9 whether there are very specific times when you
10 know shadow flicker is an astronomical
11 possibility from which you could get a
12 correction for cloudiness? Are there data
13 available?

14 A. I believe you asked me that question already,
15 and I said I don't know.

16 Q. You don't know whether the data are available.

17 A. That's correct.

18 Q. Have you looked very much at what we call
19 "Service A(?)," the airways weather
20 observations?

21 (Court Reporter interrupts.)

22 A. In what respect?

23 Q. Have you looked at them? Do you see -- do you
24 know what's in them?

1 A. Are you talking about real-time, you know,
2 hourly meteorological data?

3 Q. Real-time or past-time, I'll take it either
4 way.

5 A. I have looked at them, sure.

6 Q. And you realize there are cloud data in that?

7 A. Yes, for -- yes, there are.

8 Q. And they are recorded, like, every hour, and
9 sometimes even more often?

10 A. I don't know how often they're recorded.
11 Generally every hour, I believe, yeah.

12 Q. They are recorded every hour, and in between a
13 lot of the time. So there are very specific
14 and very precise data available from which you
15 could determine whether there were more clouds
16 any particular time of day on average and at
17 other times of the day. Yes? No?

18 A. Well, I guess I told you I'm not aware of that
19 data. You're telling me it's a fact. I guess
20 that's -- that's what you're telling me.

21 Q. You said you've seen airways data and it's
22 every hour. Isn't that what you said?

23 A. Yes.

24 Q. Which part of what I said is a problem? You

1 agree there are hourly data and it has clouds.

2 A. Yes. Yeah.

3 Q. What am I missing?

4 A. I don't know where -- what you're asking, where
5 you're going with this. There's hourly data
6 that has cloud information, yes.

7 Q. So you could get the data much more precise
8 than the average for the daytime. You could
9 get it by hour, and even better than that
10 sometimes. Is that not -- are the data there
11 to get cloudiness for the hours rather than an
12 average for the day?

13 A. I know that that data is recorded. Whether
14 they're available hourly for NCDC, the National
15 Climatic Data Center, I'm not sure. I know
16 they're recorded real-time. I don't know how
17 they're archived.

18 Q. I can assure you they're there, as their best
19 customer.

20 Let's go back again. If you were to agree
21 that there are things called "hourly weather
22 observations" which have cloud data in them,
23 wouldn't that allow you to make corrections for
24 very precise times of day rather than just the

1 average for the day?

2 A. You would still need to do some type of
3 statistical averaging to come to any kind of
4 conclusions. In other words, in any given
5 year, it could be different on a given day.

6 Q. That's correct.

7 If I were to show you what's called the
8 "U.S. Air Force Technical Application Center
9 Worldwide Airfield Climate Data," and that it
10 had things in there by time of day, would you
11 suggest that somebody had already done that --
12 would you agree that somebody had already done
13 it? I have it here if you'd like.

14 A. I haven't seen it. I can't comment on it.

15 (Dr. Ward hands book to witness.)

16 A. Okay. I'm flipping through a large book here
17 from 1970. What do you want me to do with it?

18 Q. Well, do you see in there there's time-of-day
19 data about cloudiness and visibility and rain
20 and snow? In other words, even back 40 years
21 ago somebody had been compiling the data which
22 you are concerned may or may not have ever been
23 put together. I have no doubt that there's an
24 update to that. The point being, it's been

1 done. It's available. It may not be precisely
2 what you need, but it does talk about time of
3 day. And you'll notice there's a lot of things
4 that change by time of day, of which cloudiness
5 is only one. Would you agree with that? The
6 definitions for the little things are in the
7 front of the book, if you need that.

8 A. I'm wondering if maybe you could explain this,
9 since this is from the 1960s and earlier. Are
10 these all manned weather stations? They're all
11 24-hour-a-day manned?

12 Q. Some are, some aren't. You'll notice data
13 missing for a lot of --

14 A. I see that, yes. I don't --

15 Q. They took -- as far as I can tell, they took
16 whatever was available. But obviously, there
17 was a lot of data available.

18 A. So...

19 Q. The Air Force existed in World War II, and so --

20 A. Yeah, I don't see data for every hour in here.
21 I see data for selected hours.

22 Q. That's correct.

23 A. So that doesn't help me, though. Under what
24 you're suggesting, I would need data for every

1 hour --

2 Q. Oh, no. I'm sorry. If I suggested that it was
3 exactly what you needed, I stand corrected.

4 A. Okay.

5 Q. Point I'm making is that there are data from
6 which you can get a lot of breakdown by time of
7 day. My question then is: The data, the
8 meteorological data that you require for
9 determining the meteorological correction is
10 available; is it not?

11 A. It would not be available in the software
12 program that's used. The only one that I'm
13 aware of in the industry to calculate shadow
14 flicker, that does not have the capability to
15 let you put in some type of hour-by-hour
16 percent of cloudiness versus not cloudiness.
17 It does it on a monthly basis, and that's what
18 we used.

19 Q. I did not -- I don't think I ever said that it
20 was available in your program. Your program
21 selected -- I'm asking why something is
22 selected which is transparently not the number
23 that you really wanted to get. You're
24 talking -- there's only a few minutes of the

1 day when shadow flicker could happen. It's
2 well known, place, time and everything. And
3 there are data available. But the model, or
4 you or somebody, has chosen not to even make an
5 attempt to get it. And I find the use of
6 percent of sunshine to be a very strange
7 parameter used to correct the model. Now, if
8 you don't know why it was done, or you think
9 that there's something that needs to be done,
10 just say you don't know.

11 MR. NEEDLEMAN: Mr. Chairman, I'm
12 going to object. This is more argument at this
13 point than cross-examination, and I do think
14 Mr. O'Neal has addressed this issue.

15 PRESIDING OFFICER SCOTT: Yeah, I do
16 think the question's been answered. I believe
17 we -- at least I understand where you're going
18 Mr. Ward. But I think the witness has answered
19 your question.

20 MR. RICHARDSON: I'm just wondering
21 if we could cut to the chase and get to the
22 question of, well, assuming you used hourly
23 data, what difference it would make and
24 whether it's -- I mean, this witness either

1 knows the answer to that or he doesn't, and
2 then we're done. I mean --

3 PRESIDING OFFICER SCOTT: I thought
4 he answered that, too, actually.

5 MR. RICHARDSON: I may have
6 forgotten.

7 PRESIDING OFFICER SCOTT: How close
8 are you, Mr. Ward?

9 DR. WARD: I'll switch to another
10 subject.

11 PRESIDING OFFICER SCOTT: And again,
12 you might not like my characterization, but if
13 you don't like the answer, it doesn't mean you
14 keep asking --

15 DR. WARD: Well, I give him a chance
16 to say he doesn't know, but then he -- I don't
17 quite get that answer. He always has that
18 option.

19 PRESIDING OFFICER SCOTT: Okay.

20 DR. WARD: And if I didn't give him
21 that option, you enforce it.

22 PRESIDING OFFICER SCOTT: All right.

23 BY DR. WARD:

24 Q. Okay. Let's turn to a little different

1 subject. If I were sitting on the ocean or on
2 a totally flat area and I were looking around
3 at the sky, and I just kept looking and looking
4 day after day after day, through the day and
5 whatever, would I see fewer clouds right over
6 me than I would on the horizon?

7 MR. NEEDLEMAN: I'm going to object
8 at this point. I don't understand the
9 relevance of this and --

10 DR. WARD: Well, you can wait
11 until we get --

12 (Court Reporter interrupts.)

13 MR. NEEDLEMAN: I don't understand
14 the relevance of this. And Dr. Ward is well
15 past his estimated time for examination. And I
16 recognize everyone gets a fair chance to ask
17 questions, but I think we're beyond relevant
18 questioning at this point.

19 PRESIDING OFFICER SCOTT: Why don't
20 you humor me, Mr. Ward, and start with where
21 you want to end up here. So what's your
22 overall question that you're going to?

23 BY DR. WARD:

24 Q. Isn't it true, from your training and

1 observations in meteorology, that there always
2 appears to be more clouds low down on the
3 horizon than overhead?

4 A. Sometimes that's the case. I wouldn't say it's
5 always the case.

6 Q. I'm saying generally.

7 A. I don't like the word "generally." Generally
8 where?

9 Q. On average. Would you buy that one? Isn't
10 there generally fewer clouds that you see
11 overhead than on the horizon?

12 A. In the mountains? At the beach?

13 Q. Everywhere.

14 A. Again, I'd say it depends where you are.
15 Mountains can be different than if you're in
16 the desert or if you're at the beach. So I
17 guess I'm not going to necessarily just accept
18 that characterization, you know, straight up.

19 PRESIDING OFFICER SCOTT: Mr. Ward,
20 let me try again. So what's your ultimate
21 question that you're trying to get answered?
22 Was that your ultimate question, or is that a
23 lead-up? What I'm trying to get at is I think
24 at this point we don't need the lead-up

1 questions. What I'd like to hear, and then we
2 can go back to the smaller questions if we feel
3 it's needed, is what's your ultimate -- what is
4 it you're trying to ask?

5 MR. WARD: My ultimate goal is to
6 question Mr. O'Neal's qualifications to maybe
7 answer my questions. But let's try it a little
8 differently.

9 BY DR. WARD:

10 Q. If I were looking -- back up.

11 (Court Reporter interrupts.)

12 Q. "Visibility" in meteorology is defined as
13 "horizontal visibility"; is it not?

14 A. That's true.

15 Q. And the equipment that we measure it with is
16 always looking at the horizontal?

17 A. That's my understanding, yes.

18 Q. My understanding, too.

19 Okay. Do you know what the reason is that
20 it's so carefully defined?

21 A. I don't.

22 Q. Anybody looking at a turbine -- this has to do
23 with shadow flicker now -- would almost,
24 without exception, would be looking upward; is

1 that correct?

2 A. Yes.

3 Q. Only a few of us who might live on a higher
4 hill. But most of us would be looking upward.

5 So, if the fraction, the average fraction
6 of cloudiness were less on an uphill view than
7 on a horizontal view, that would seriously
8 affect the cloud -- the probability of a cloud
9 interfering in the line of sight between the
10 sun, the turbine and the viewer. Would that
11 not be true?

12 A. To do these calculations, as we talked about
13 before, it's all geometry, pretty much. You
14 know, the sun is shining. You've got a turbine
15 and a location, a house. And so is there a
16 shadow cast at different times of the day as
17 you march through the 24 hours -- or the
18 daylight hours, is there a shadow cast at that
19 location? That's how the expected numbers are
20 calculated. That's all it is. So there's no
21 cloudiness at all there. I'm sorry. The
22 astronomical numbers are calculated that way.
23 The expected numbers then reduce that by a
24 small percentage based on the fact that it's

1 not sunny every day here in New Hampshire. So
2 there's a fractional reduction in the possible
3 times that there can be shadow flicker on those
4 hours and those days where it is "possible."

5 Q. It sounds like we're agreeing on part of it.
6 But I'm trying to get a little further along.

7 You've seen the observations or heard of
8 the observations at Mount Washington; have you
9 not?

10 A. Yes, I have.

11 Q. And they talk about seeing 200 miles and things
12 like that.

13 A. They sometimes can see a long way up there.

14 Q. But sometimes they don't see at all.

15 A. That's right.

16 Q. Okay. Have you ever looked, for example, at
17 the number of times when Mount Washington --

18 (Court Reporter interrupts.)

19 Q. How often Mount Washington Observatory records
20 200 miles visibility?

21 A. I have no idea.

22 Q. Would you agree that, in order to get 200 miles
23 horizontal visibility, you couldn't have any
24 clouds for 200 miles?

1 MR. NEEDLEMAN: I'm going to object
2 to relevance. I just don't understand how this
3 relates to Mr. O'Neal's testimony.

4 PRESIDING OFFICER SCOTT: Again, Mr.
5 Ward, I prefer you get closer to the point. I
6 feel like you're trying to get a sequential --
7 a little bit at a time. And I think at this
8 point, late in the day, we'd prefer you to get
9 closer to the point a little bit quicker. Does
10 that make sense to you?

11 MR. WARD: Well, if I could get the
12 witness to agree to what I think every
13 meteorologist would know in his gut, we'd get
14 there a lot faster. But he is denying some
15 very obvious things which one would have
16 learned in Meteorology 101, and I'm having a
17 terrible time as a result of that. So I think
18 I have to -- I'm sort of forced, because of the
19 witness's either lack of knowledge or
20 unwillingness to agree to certain things, to go
21 about it the long way. Now, the difficulty
22 here is that in Meteorology 101, everybody who
23 goes through it knows that as you look further
24 down on the horizon, the odds on seeing the sky

1 decrease steadily. The angle at which you
2 observe cloudiness -- and we're talking about
3 in the case of shadow flicker -- way down on
4 the horizon goes up by factors of 10 or 100.
5 They're not small factors. They're big
6 factors. And as you just go up, just think to
7 yourself: How often do you see the sun
8 actually set? And the answer is: Not very
9 often compared to when you see it up in the
10 sky. Because in order to seeing it set, you
11 have to look through miles and miles of
12 atmosphere with no clouds. The odds on that
13 just drop dramatically as you go low.

14 The situation we're sitting
15 here, shadow flicker is that case. It's on the
16 low end. And more than that, which is finally
17 relevant to where I want to get to is, it's not
18 quite that either, because every time we talk
19 about shadow flicker, every receptor is looking
20 up a little bit. And to go from here up 1
21 degree decreases the clouds by like a factor of
22 10. It's not a minor thing. And the thing
23 that's being used in the model is totally
24 irrelevant to everything. And I'm trying to

1 find out, first of all, if he knows why it --
2 where it came from, and has anybody, including
3 himself, looked at getting a number which would
4 be a far better correction than just going
5 from, if I read the numbers correctly, from 20
6 to 30 hours a year down to 8. That's a big
7 correction.

8 PRESIDING OFFICER SCOTT: Okay.
9 That's good. So, two things: You will get a
10 chance. There's an opportunity for people to
11 testify. This is not the time.

12 But having said that,
13 Mr. O'Neal, you just heard two questions there,
14 I think, at least. First of all, do you agree
15 with --

16 WITNESS O'NEAL: Well, certainly one
17 point I heard Dr. Ward say is certainly as the
18 sun is very low in the sky at sunset or
19 sunrise, you then have the longest distance
20 through the atmosphere. That's absolutely
21 true. The optical depth in that case is the
22 longest, as opposed to looking straight up in
23 the sky. That's why we don't see blue sky in
24 the horizon. It's milky even on a clear day.

1 Now, if there's clouds, as he suggests, and it
2 happens a lot, then that's going to be even
3 less shadow flicker because that's going to
4 block the sun from -- shadow flicker is created
5 essentially during sunrise or sunset at these
6 distances. You know, you're only going to have
7 it close to the turbine if the sun is at a very
8 short distance. So, at the distances we're
9 talking about, it's going to be sunrise or
10 sunset.

11 I'm not sure I've answered the
12 question. I agree with him on the low sun
13 angle discussion. I'm not sure there's a
14 question in there. But certainly there's a lot
15 of interference between the sun and us as an
16 observer when the sun is low in the sky, yes.
17 I don't know what the second question was, if
18 there was one. Maybe somebody could read it
19 back.

20 BY DR. WARD:

21 Q. I asked whether -- I think I said, doesn't the
22 amount of cloudiness then behind the turbine
23 decrease as you go up, and do we agree that
24 everybody that's going to see this and is

1 affected by it is always looking up at a
2 substantial angle?

3 A. Oh, we certainly agree that people, you know,
4 as you say, unless they're on a mountaintop
5 across the valley, they're at a lower
6 elevation, so they're going to be looking up at
7 the ridgeline. The climatic data, the percent
8 of possible sunshine from the Concord National
9 Weather Station, which is what went into the
10 model, doesn't differentiate between whether
11 the clouds are low in the sky or high in the
12 sky. It just says the percent of the time
13 during daylight hours when there are clouds
14 present. That type of refinement, Dr. Ward
15 suggested that that data could be available.
16 It's not something we can take and put into the
17 model to do those calculations, though.

18 MS. LINOWES: Mr. Chairman, I think I
19 think I could help ask Dr. Ward's question. I
20 know where he's going, but I'm not sure if he's
21 stating it, if that would be okay.

22 MR. NEEDLEMAN: I would actually
23 object. Ms. Linowes will get her
24 opportunity --

1 PRESIDING OFFICER SCOTT: Yeah, you
2 can do that next.

3 MS. LINOWES: Okay.

4 MR. WARD: I'm finished on this.

5 PRESIDING OFFICER SCOTT: You're
6 finished on that? I'm glad to hear that. So
7 we're at 5:00.

8 MR. WARD: My wife will divorce me if
9 we keep going.

10 PRESIDING OFFICER SCOTT: Well, I
11 wouldn't want that to happen.

12 So this is a natural break
13 point. But before we leave, how much time do
14 you think you have for Thursday?

15 MR. WARD: Well, certainly a number
16 of hours. I haven't gotten to -- I haven't
17 finished with shadow flicker, and I still have
18 icing and a number of other things to take care
19 of.

20 PRESIDING OFFICER SCOTT: So what I'm
21 going to ask you to do is think, between now
22 and Thursday, is there a way for you to be more
23 concise in your questions. So I understand
24 you're trying to have the witness go through a

1 sequence for you. But we've taken a fair
2 amount of time today. And out of deference to
3 everybody here, including the Committee, I want
4 you to think through a little bit about the
5 point you want, and maybe even start with the
6 point so that the --

7 DR. WARD: I will sharpen my
8 questions, Mr. Chairman.

9 PRESIDING OFFICER SCOTT: Okay.
10 Thank you.

11 So, with that, are there any
12 administrative details we need before we
13 adjourn today? Anybody? Anything?

14 MR. NEEDLEMAN: Could you just remind
15 us of what time we're starting on Thursday?

16 PRESIDING OFFICER SCOTT: I was going
17 to do that, and I will. That's Thursday at
18 9:00. Ms. Linowes?

19 MS. LINOWES: Yes, Mr. Chairman. I
20 just wanted confirmation on who's going to be
21 here on Thursday.

22 PRESIDING OFFICER SCOTT: So, for
23 panelists, Mr. Needleman?

24 MR. NEEDLEMAN: Well, obviously we

1 need to finish Mr. O'Neal. And then next up
2 would be, I think, Mr. Raphael. Do we have
3 some sense of how much longer Mr. O'Neal is
4 going to take? That's going to influence when
5 I ask Mr. Raphael to get here.

6 PRESIDING OFFICER SCOTT: Ms.
7 Linowes, how long do you think you'll take?

8 MS. LINOWES: Yes, Mr. Chairman. I
9 asked for two hours, and I believe it's going
10 to take two hours.

11 PRESIDING OFFICER SCOTT: And Counsel
12 for the Public?

13 MS. MALONEY: I'm going to take a lot
14 less than I thought. Maybe 15 minutes.

15 PRESIDING OFFICER SCOTT: So you'll
16 only do 15 minutes?

17 MS. MALONEY: Or less. There's been
18 a lot of questions asked.

19 PRESIDING OFFICER SCOTT: It's in the
20 transcript now. Does that help?

21 MR. NEEDLEMAN: Yeah, a little bit.

22 PRESIDING OFFICER SCOTT: He says
23 with a lack of enthusiasm.

24 Okay. So, again, we'll adjourn

1 to Thursday, which is the 23rd, I believe, at
2 9:00. Is that right, the 23rd?

3 MR. NEEDLEMAN: The 22nd.

4 PRESIDING OFFICER SCOTT: The 22nd.

5 Excuse me. Thank you.

6 (Whereupon Day 3 Afternoon Session ONLY
7 was adjourned at 5:05 p.m.)

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