

25 March 2017

Mr. Robert R. Scott, Presiding Officer
Site Evaluation Committee
Public Utilities Commission
21 South Fruit Street
Concord, NH 03301-2429

Dear Commissioner Scott:

The Meteorological Intervenors submit their appeal of your Order of 17 March 2017 in the matter of SEC 2015-02, Antrim Wind.

Motion to Rehear

Site 202.29 (d) states "A motion for a rehearing shall (1) Identify each error of fact, error of reasoning, or error of law". However, the category of the most frequent and egregious Committee errors in the SEC 2015-02 Order is a new category which includes all of the above, errors of Omission of evidence. The Committee ignored these orphan issues in spite of the Rules requiring their consideration. Therefore, this appeal is on the multiple bases of the Omission of Key Facts, Failure to follow the Law and Failure to determine whether each AWE proposition (RSA 541:4) "is unlawful or unreasonable". These multiple failures will be stated simply as Omissions, leaving it to the Committee to select an appropriate LAW, FACT or UNREASONABLE category.

More importantly, the outcome of an error of omission is, in itself, dispositive evidence that the Committee violated a more fundamental rule, Site 202.19 (a) and (b), the Burden of Proof requirement. If certain evidence was never considered, as the many noted below, there was no way that the Committee could have determined whether, or not, the "party (AWE) asserting a proposition shall (did) bear the burden of proving the proposition by a preponderance of the evidence". There were many "propositions" asserted by AWE during the course of these proceedings for which the Committee could not claim AWE had shown a preponderance of evidence, because the Committee never acknowledged, discussed, or ultimately judged these propositions, or weighed the evidence pro and con.

This abnegation of responsibility by the Committee was most egregious in the matters covering the technical issues of astronomy, meteorology and topography. AWE did NOT meet the standards specified in 202.19 (a) and (b), by ignoring many obvious meteorological problems arising from its proposed facility, misdirecting and misinforming the SEC, and finally omitting information that was prejudicial to approval. Site 202.19 (a) requires the applicant to "bear the burden of proving the proposition by a preponderance of the evidence". And Site 202.19 (b) requires that the applicant "shall bear the burden of proving facts sufficient for the committee.....". In the proceedings and report, the members of the SEC ignored these serious omissions.

When the Committee totally omits any discussion of evidence to support a particular AWE assertion, it is dispositive proof that the Committee never attempted to determine the preponderance of evidence. These failures by AWE to demonstrate a "preponderance of evidence", and the failures by the Committee to debate and determine whether AWE demonstrated a "preponderance of evidence", make a mockery of this adjudicative process. Any one of these failures would meet the standard for requiring a rehearing. The wide range and deadly seriousness of these failures cannot be corrected without a broad and penetrating rehearing. This criticism that both AWE and the Committee ignored the

“preponderance of evidence” issue applies, to a greater or lesser extent, to many of the issues discussed below.

These omissions, and the resultant failures of both AWE and the Committee to understand serious technical issues, negates the statements #2, 3, and 5 on page 2 of the Order, and the futility of fulfilling conditions #1 and #6 on page 10 and condition #1 on page 11 of the Order. In addition, the AWE proposals to monitor and mitigate post-construction noise and shadow flicker are simply not technically possible as proposed by AWE/Siemens, and may be impossible under any circumstances.

List of Errors, discussed in detail below:

- 1 Preponderance of Evidence.....
- 2 Pre-Construction Noise
- 3 The G Factor
- 4 Post-Construction Noise
- 5 Ducting
- 6 Pre-Construction Shadow Flicker.....
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- 8 Solar Enlargement and Shadow Flicker...
- 9 AWE Response 29 September 2016.....
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- 11 Meteorological Correlations.....
- 12 Shadows and Reflections.....
- 13 Worst Case.....
- 14 Mitigation and Efficiency.....
- 15 Flicker-caused Vehicle Accidents.....
- 16 Ice Throw.....
- 17 Nighttime Lighting and Radar.....
- 18 Misdirection of Visual Impact
- 19 Ignoring Nighttime Visual Impact
- 20 Tipping the Scales of Justice

1 Preponderance of Evidence

Error of Law

The Committee never determined whether AWE had presented the preponderance of evidence required by 202.19 (a) and (b), to show they met the criteria for noise and shadow flicker, both pre- and post-construction.

Unlawful Order

With no determination that AWE presented the preponderance of evidence, the Committee could not lawfully approve the AWE application.

Proposed Legal Conclusion

The Committee was required to deny the AWE application.

Extended Argument

The Committee did not follow Site 202.19 (a) that requires “The party asserting a proposition (e. g. not exceeding noise or shadow limits) shall bear the burden of proving the proposition(s) by a preponderance of the evidence”. The Committee never weighed the evidence presented by Ward against the evidence presented by AWE, nor discussed or deliberated whether AWE had met the 202.19 (a) standard. Black's Law Dictionary defines “preponderance of evidence” as “the greater weight of the evidence”. Any determination of “greater weight” requires a prior determination of the individual

weights, followed by a comparison of these weights. Nowhere in the Committee's three days of deliberations did the Committee weigh Ward's testimony, evidence, or criticisms of O'Neal against O'Neal's testimony or evidence. There is also no such weighing or comparison made in the AWE post-hearing brief. This oversight(?) is carried through in the final Order.

There are two very critical and fundamental meteorological questions addressed by AWE to which this "preponderance of evidence" question applies. Will the proposed facility produce "worst case noise" over the prescribed limits, and, to what extent will the facility exceed the 8-hour limits for shadow flicker? While there are many other meteorological issues to which such a question applies, these two are fundamental to the determination by the committee as to whether the proposed facility belongs in a residential neighborhood in Antrim.

In the determination of the weights of the evidence presented on the issues of noise and flicker, the evidence is overwhelming that the Committee NEVER weighed the testimony and evidence by Ward, and therefore was unable to determine its weight in comparison to the competing evidence presented by O'Neal. Whether the Committee overlooked their responsibility to make such a comparison because they finally realized that they did not have the evidence required to make it, or whether the Committee never understood that they were required to make such a weighing is unknown. Either way, the transcripts, and the final Order, demonstrate that no comparison was ever made, and no comparative weighing was ever performed. The Committee approval of the AWE application is illegal.

2 Pre-Construction Noise

Error of Omission

No recognition, discussion or evaluation by the Committee in their deliberations, of the serious technical limitations in the pre-construction AWE Cadna/A model (built on ISO 9613-2) of noise, and their complete omission (until their final brief) of any discussion of the requirement of Site 301.18 (c) (3) to determine the "worst case wind turbine sound emissions". The Committee ignored the stated limitation of ISO9613-2 (p13) to "moderate downwind conditions limits the effect of variable meteorological conditions on attenuation to reasonable values", and other serious limitations clearly stated in ISO 9613-2. These limitations mock the AWE claim of "worst case".

Unlawful Order

By not determining whether the application met the SEC "do not exceed" limits, the Committee unlawfully decided that the AWE Application met the 40 and 45 Db criteria as specified in the Rules.

Proposed Factual Reasoning

By correcting for the meteorological limitations of ISO 9613-2, and recognizing the added requirement of Site 310.18 (c) (3), the Committee had to decide that the AWE application failed to show that it would meet the noise levels criteria, requiring the Committee to deny the application.

Extended Argument

In DD2, AM, p81 and following, member Clifford stated "under 301.08 we need to talk about the sound impact assessment". However, 301.08 says "as specified in Site 301.18". Member Clifford said (DD2A, p82) "They (O'Neal) did assume worst case directions, wind speeds". But there was no evidence presented by AWE (O'Neal) that spoke to the "worst case" noise. Moreover, lacking an objection by any other member, that view must have represented their MISunderstanding too. The only remark in the Committee's Deliberations that even suggested that there were problems with O'Neal's data was a single sentence about the testimony of Ward (DD2, AM, p84), and a single reference to the testimony of James (DD2, AM, p82). These were weighted against numerous references to O'Neal and Kenworthy. On DD2, AM, p90,91, member Forbes stated his conclusion, and his only mention of disagreement with O'Neal was "the challenges to that model are somewhat, I think the word would be,

not unimportant but ineffectual". Did he mean "otiose"?

After a very serious misrepresentation by member Weathersby of the G factor used by O'Neal, the G factor was tossed in the waste bin too. Member Weathersby adds a suggestion to retest at the Berwick property, despite there being no agreed testing method, and without specifying a G factor, OR A SEASON OF THE YEAR. Member Clifford then added some comments about sound testing which is completely irrelevant to the question as to whether the pre-construction noise modeling met the "worst case" requirement of 301.18 (c) (3). On p98, member Rose states "the G factor of .5 seemed to be reasonable, without ever understanding that there will be a world of difference between the G factor in summer (5 months) and winter (7 months). Member Clifford (mis)agreed on p100.

In the SEC Order, V, F, 5, a (Sound), (b), page 149-154, the 137 pages of cross-examination by Ward of the meteorological testimony of Mr. O'Neal is nowhere to be found. This cross-examination refuted almost all of O'Neal's testimony, yet the Committee quoted O'Neal's direct testimony for 3 ½ pages in their Order (pp145-149). This "oversight" could suggest that the Committee was reluctant to hear contradictory evidence.

3 The G Factor

Error of Fact

A most revealing fact, ignored by the Committee, was the extreme difference between the G factor in summer vs winter in Antrim, and its effect on the discussions of the "worst case" sound emissions. On the occasions when the G factor was discussed, the comments of the Committee revealed that they did not understand this fact, rendering all such discussions either irrelevant, or factually misrepresented.

Unlawful Order

The result of this gross lack of understanding is to substantially underestimate the "worst cases" of radiation of sound waves to the neighbors, make mitigation impossible, and require a denial of the application.

Proposed Factual Reasoning

The winter calculation of sound emissions must use "winter" vegetation and assume "winter" surfaces in the calculation of sound levels. Winter sound measurements at an operating IWF need to be taken and analyzed under the criteria in 301.18 (c) (3). This alternative calculation of noise levels would have led the Committee to deny the application.

Extended Argument

The ground surface in Antrim for many months of winter, will be covered with bright, white snow, often with a smooth ice surface which is highly reflective of sound. In addition, the ground cover surrounding the Antrim site is substantially deciduous, without foliage for seven months of the year. As can be seen in a satellite picture from space, or as would be seen by an observer atop Tuttle Hill or Willard Mountain, this view shows very limited obstructions to either light or sound waves. Mr. O'Neal mischaracterizes this view as composed of absorbent material for both light and sound waves, selecting a G factor of 0.5 for all seasons of the year, including winter. On many nights of winter the G factor would be close to zero. These would also be the candidates for "worst case noise". Ward (Prefiled testimony, 21 May 2016) explained this difference to the Committee but there is not a single reference to it in the Deliberations, in spite of the many references to the G factor. A view from Rte 9 in Stoddard shows mostly brown cover. A driver traveling easterly on Route 9 on a winter afternoon in winter would easily see that the westerly slope of the Tuttle Hill/Willard Mountain ridge is brown, with the underlying snow surface clearly visible, and little obstructed by foliage.

There is an additional consideration in calculating how the ground attenuation of turbine noise applies.

Since the sound is generated 1000' or more above its neighbors, the travel paths of the noise from the turbine to most homes is NOT THROUGH FOLIAGE, but predominantly through clear air, with a G factor of zero, 0.0. That means that the noise reaching its neighbors will be substantially higher than the levels calculated by AWE.

4 Post-Construction Noise

Error of Omission

No recognition, discussion, evaluation or deliberation by the Committee of the serious inconsistencies in, and the lack of technical explanations, in the post-construction AWE proposals for monitoring and mitigating noise. This lack of recognition began with a complete disregard by the applicant and the Committee for determining the meteorological and topographical conditions which would lead to the worst case noises, and the neighboring areas which were most likely to experience it. "Worst case" noise levels will necessarily be of short duration, likely a few hours, requiring a rapid response, and prepared in advance. Without a prior determination of the meteorological factors which are likely to produce the worst case noise levels and the guilty turbines, there is no way to determine the guilty turbine(s), and properly mitigate. There is nothing in the AWE testimony, written or oral, which even suggests that AWE, or the committee, have considered these meteorological and topographic factors.

Unlawful Order

By never questioning the applicant about what meteorological situations which are likely to produce the worst case noise, and which neighbors are likely to be affected, and by which turbines, the Committee wrongly decided that the AWE Application provided a realistic basis for monitoring and mitigating post-construction noise, if indeed there is one.

Proposed Factual Reasoning

The Committee needs to require AWE to determine what meteorological and topographical conditions lead to the worst case noise, which neighbors are likely to experience noise over the prescribed limits, and where to monitor noise most effectively so as to be able to properly mitigate any excesses, prior to their occurrence, and prior to any approval of the AWE application.

Extended Argument

When the Committee considered Post-Construction Noise, it showed an unfortunate lack of curiosity about the real problems with monitoring this noise. As any competent meteorologist knows, the noise levels and the preferential direction of loudest broadcast will be geographically and topographically dependent, with some areas frequently getting lots of noise, and louder noise, than other areas, and at different times of the day and night. Yet the committee never requested AWE to supply information on this well-expected effect, nor much concern for the neighbors most likely to feel the most, and most frequent, noise effects. In the hearings, there was no discussion of the information from other operating wind facilities, if such is available. There was lots of discussion of who should be responsible for monitoring noise, and what AWE may do, or not do, to mitigate noise problems. From a meteorological perspective, the oft requested, but never produced, data from the met tower would have been extremely helpful. It would likely have shown that the wind speeds and wind shears on the Tuttle ridge were strongly affected by the topography, and the wind direction, with implications for noise generation and propagation, and that the incidences of excessive noises would occur with little warning and require both careful monitoring and rapid mitigation.

One of the more interesting Committee comments was by the Chair (Day 2, AM, p107). "the Applicant to conduct sound studies ... to respond to sound-related complaints". A great ex-post-facto suggestion. Such comments merely highlight the almost insoluble problem of quickly mitigating loud noises in the middle of the night. And after they are mitigated, does everyone return to a "sound" sleep, until the next burst of noise?

5 Ducting

Error of Omission

No recognition, discussion or evaluation by the Committee in their deliberations of the well-known effects of atmospheric ducting, and its effect in enhancing the broadcast of noise far and wide. Worse, when Ward cross-examined O'Neal (Day 3 PM, P125) O'Neal's responses demonstrated that he was only subliminally aware of it, or its importance. Ducting is likely to be a constant problem in the long nights of winter, with a strong temperature inversion, a highly reflective (ice-coated) snow cover and leafless deciduous growth.

Unlawful Order

It is well known that wind turbines make their loudest noises at night. It is also well known to meteorologists that the extreme case for the propagation of turbine noise occurs when there is a strong temperature inversion. Such inversions occur on the long nights of winter with a snow cover acting as a radiator of heat to space. Ignoring the resultant ducting of turbine noise, and failing to determine the extreme noise broadcast when ducting is occurring from actual measurements, allowed the Committee to ignore one of the most important factors in determining whether AWE would meet the noise standard, and whether they had a serious plan for post-construction mitigation. This oversight allowed the Committee to unlawfully approve the AWE application.

Proposed Factual Reasoning

The difficulty O'Neal demonstrated in "understanding" ducting should have led the Committee to disregard most of his testimony, and his conclusions about noise propagation, leading the Committee to deny the AWE application, because their facility will exceed its noise limits on many winter nights. At a minimum, the Committee should require O'Neal to determine the number of nights with significant ducting from actual measurements, and redo his calculations with a realistic value of wintertime G.

Extended Argument

Site 301.14 (f) (2) (a) states "shall not exceed", and Site 301.18 (c) 3 states "Include predictions for the wind speed and operating mode that would result in the worst case wind turbine sound emissions during the hours before 8:00 a.m. and after 8:00 p.m.". In order for that requirement to be fulfilled, AWE would have to have analyzed some real data to determine what meteorological situation would likely produce ducting, and the neighbors most often, and most seriously, affected.

Mr. O'Neal's limited understanding of the common meteorological term "ducting", underlined his aversion to facing the issue of the extreme effects of the common temperature inversions over a snow/ice surface on the long nights of winter in Antrim. He also had an aversion to acknowledging the sound reflecting properties of that underlying snow/ice surface, and the lack of deciduous foliage for sound absorption. These aversions allowed him to substantially (and mistakenly) reduce the area and the intensity of the broadcast of the turbine sounds to the neighbors. Ducting is a commonly known meteorological effect, an extreme case of sound propagation. O'Neal seemed unaware of it.

6 Pre-Construction Shadow Flicker

Error of Omission

Site 301.14 says the flicker analysis should cover all structures "within one mile of a wind energy project". However, in their deliberations the Committee ignored the repeated criticisms by Linowes of O'Neal's decision to deliberately reduce the hours of shadow flicker in his pre-construction model, by arbitrarily limiting his analysis to only those residence/turbine pairs which are within one mile of each other. This limitation, an outrageous perversion of the Rules, ignores the additional, and additive, effects of noise from other turbines. O'Neal's definitional change is obviously contrary to 301.14. The Committee never discussed the effect of, nor the obvious conclusion to be drawn from, O'Neal's

misdirection. In addition, in the SEC Order, V, F, 5, a (Sound), (b), page 149-154, the 137 pages of cross-examination by Ward on the meteorological testimony of Mr. O'Neal is nowhere to be found.

Unlawful Order

O'Neal's unsupported change reduces the number of hours of flicker of homes within one mile of the facility which were predicted to receive 8 hours or more of flicker. It also reduces the number of homes which would get 8 hours or more. It is hard to justify such a "mistake", other than as a deliberate attempt to "cook the books". The deliberate miscalculations should be sufficient to exclude ALL of Mr. O'Neal's testimony, either on the basis of deliberate falsifications, or sheer incompetence. The Committee chose to credit, rather than discard, O'Neal's testimony, and unlawfully approved the Application.

Proposed Factual Reasoning

By correcting the meteorological data, assumptions and calculations, the AWE model would show that the facility would violate the 8-hour limit for many more residences, and add many more hours at those residences which already exceed the limit.

Extended Argument

Site 301.14 (f) (2) (b) states "the shadow flicker created by the applicant's energy facility during operations shall not occur more than 8 hours per year at or within any residence...". There is no stated limit on the proximity of the residence to a turbine or anything else. By contrast, the information submitted to the SEC by AWE/O'Neal is restricted to ONLY those residence/turbine pairs which are within one mile of each other. Given the information in O'Neal's 17 February 2016 submission (e. g. Site 77-77, and others), it is obvious that the contribution to shadow flicker at just under one mile is very significant, demonstrating that his 1-mile cutoff was arbitrary, and that flicker from distances beyond 1-mile will add significantly to the total hours. He chose 1-mile based on no evidence, deliberately and illegally misleading the Committee as to the predicted hours of shadow flicker at residences both inside and outside the 1-mile limit. Such a selection, given the clarity of his own results at 1-mile, suggests a deliberate attempt to deceive the Committee. It is clear that these O'Neal data must be discarded. It might also suggest that his other comments, conclusions and data deserve similar treatment. After these data are discarded, there is no evidence remaining to support AWE's claim that the facility can meet the 8-hour requirement.

In addition to this fatal error, there was no recognition, discussion or evaluation by the Committee in their deliberations of serious internal inconsistencies and limitations in the pre-construction AWE model. These inconsistencies and limitations included, but are not limited to, the use of percent sunshine as a proxy for cloudiness, the error-ridden O'Neal 28 September 2016 response to the 20 September 2016 request by Ward for information on percent sunshine and its use in predicting shadow flicker, the lack of data to verify that the AWE model is even applicable to the calculation of shadow flicker, and the misuse of correlated meteorological data to correct for wind direction and cloudiness. Interestingly, in their post-hearing brief (p59), they repeat their misunderstood comments about percent sunshine which Ward had shown to be in error, and without acknowledging the error. The Order (p160) merely repeats earlier statements and misrepresents the facts. The O'Neal calculations do not yield the hours of shadow flicker. The statement on p161, 3rd line from bottom, represents a wish by someone on the committee. It is not a fact. The statement on p163, 5th line from bottom is also wrong. There was no evidence that it covered the worst case, and the condition imposed does nothing to alleviate it

7 Post-Construction Shadow Flicker

Error of Omission

No discussion or evaluation by the Committee in their deliberations of the serious inconsistencies in, and the lack of technical explanations of, the AWE post-construction proposal, SCADA/SFCS, for

monitoring and mitigating shadow flicker. There is not even an indication in the record of the Committee's deliberations that the Committee ever saw the late-filed (7 November 2016) AWE response to Ward's request of 29 September 2016, explaining the threshold levels planned for SCADA/SFCS. This late-filed AWE response was the first, and still the only, AWE post-construction plan. The thresholds selected in these programs for solar brightness and shadow depth have apparently never been vetted. The threshold for solar brightness is absurd on its face, set at a level which is many times brighter than the threshold required for twilight vehicle operation without headlights, and the shadow depth threshold is set at a level at which shadows could not be ignored. Both these thresholds appear to have been selected to (erroneously) minimize the hours of shadow flicker.

Unlawful Order

The Committee mistakenly decided that AWE had a realistic proposal for determining, monitoring and mitigating post-construction shadow flicker, when in fact, AWE had none. This lack of understanding that the late-filed proposal was absurd on its face should have led to the denial of the AWE application.

Proposed Factual Reasoning

The monitoring of shadow flicker requires a determination of the threshold for solar brightness and shadow depth, both of which were set in the 7 November 2016 AWE response, however with little or no technical justification. These thresholds are critical to the measurement and mitigation of shadow flicker and must be required prior to approval of the Application.

Extended Argument

The AWE proposal for post-construction monitoring of Shadow Flicker was unknown until AWE finally responded, on the last day of the hearings, to Ward's second request for the relevant information. As a result, this critical information was never discussed by the Intervenors, nor the Committee, either at a hearing, or during the deliberations by the Committee. This omission should be a sufficient reason for a rehearing, by the Committee. Additionally, the astronomical and meteorological information, which AWE proposes to use in their measurements and calculation of Shadow Flicker is incomplete, and its technical justification is suspect. Worse, the critical parameters appear to be based on an ex-post-facto selection of data designed to produce a pre-determined result.

The occurrence or non-occurrence of shadow flicker depends on two fundamental parameters, sufficient sunlight to create a shadow, and a sufficient diminution of that sunlight by the turbine blades to produce a noticeable shadow. The AWE post-construction monitoring model purports to calculate the reality of shadow flicker, using astronomical, topographical and sunlight/cloudiness measurements at the site. Their model, SFCS, would watch the sunbeams in real time, calculate whether the sun was bright enough to cast (recognizable) shadows, and determine whether the shadows so cast were dark enough to be noticed as "moving shadows". A daunting task, but computationally possible, IF. Two numbers need to be selected for entry into the model, the minimum solar brightness necessary to cast shadows, and the minimum depth of the shadow, to be seen as a shadow. We know of no accepted values for either of these two crucial numbers, and it was on the last day of the hearings that AWE responded to Ward's request for the genesis of these numbers. The AWE response to Wards request was disappointing, and was never recognized in the record, nor discussed by the Committee! **THE SELECTION OF THESE NUMBERS COMPLETELY DETERMINES THE NUMBER OF HOURS OF SHADOW FLICKER. ALL OTHER CONSIDERATIONS PALE IN COMPARISON.**

The SFCS model was presented in the AWE response of 7 November 2016 (last hearing day) to Ward's request of 29 September 2016, and was never considered by the committee. It defines the two critical parameters. The minimum luminance (sunlight) "is 323 lux, which is approximately the equivalent of low light conditions at sunrise and sunset". The contrast threshold is the percentage reduction in the light that comes directly from the "shaded" sun. A 10% reduction is assumed to be the minimum required. "Flicker ceases to be provocative at luminance contrasts less than 10%". A luminance of 323

lux is quite bright, many times the luminance level at which car headlights are required. Shadows are easily visible at much lower luminance levels. As to contrast, a single flickering fluorescent in the rear of the PUC hearing room would have a contrast level near 3%, and be very annoying. On the basis of these two observations, the AWE selection of 323 lux and 10% are gross underestimates of the criteria required to “cast moving shadows” (Site 102.48), and lead directly to gross underestimates of the actual hours of Shadow Flicker.

The complete omission of the relevant testimony by the Meteorological Intervenors in the summaries by Mr. Clifford on 9 December 2016, and the total lack of corrections and additions by any member of the Committee, speaks volumes as to the Committee's understanding of these critical issues. Mr. Clifford claimed to summarize ALL the testimony on the turbine noise, shadow flicker, icing, and other meteorological factors which were discussed in detail in the hearings, and which were prominently mentioned in the filings. Instead Mr. Clifford merely repeated the testimony and filings of the AWE expert, which expert demonstrated both in his responses to Ward's questioning, and in his filings, his total ignorance of many meteorological factors. These conflicting factors should have been the subject for further discussion by the members of the Committee, and adjudicated properly. This omission of the disagreements with the O'Neal testimony, completely negates all of the Committee discussions, deliberations and judgments.

There are even more problems with the AWE proposal for post-construction monitoring of shadow flicker. The definition of shadow flicker in Site 102.48 is “alternating changes in light intensity on the ground or on structures”. And Site 301.08 (a) (2) states “to be perceived at each residence,,,,”. The Site 301.14 (f) (2) (b) referred to by Clifford (D2, p7, deliberations) says “at or within any residence”. There is no restriction, expressed or implied, against shadows that have bounced off a reflective surface. In winter in most Antrim homes, the brightest interior light comes from reflections off a bright snow/ice surface, not from direct sunshine. It was agreed in the Committee's discussion of the G factor that an ice surface almost completely reflects sound at low incidence angles. The very same is true for sunlight, which in the case of shadow flicker, is always at low incidence angles. This means that sunlight and shadows bouncing off an snow/ice surface, will also reflect both the sunlight and turbine shadow with little diminution. Such reflected shadow flicker will be equally as noticeable as the direct Shadow Flicker to which the AWE model is confined. It hardly needs stating that the ground surfaces in Antrim are coated with new snow and/or ice on 50-100 days in winter, substantially increasing the hours of Shadow Flicker. Again, when AWE and the Committee had opportunities to question Ward on this effect, they demurred. This omission is strong evidence of agreement, but this tacit agreement is nowhere to be found in the deliberations of the Committee. AWE used their post-hearing brief (p60) for a late response to Ward.

8 Solar Enlargement Shadow Flicker

Error of Omission

No recognition, discussion or evaluation by the Committee in their deliberations of the additional hours of shadow flicker which will result from the effects of high, thin clouds, in enlarging the apparent solar disk. Shadow flicker depends directly on the turbine blades crossing the APPARENT solar disk, making the number of hours of flicker directly proportional to the areal size of this disk. In meteorological conditions with high thin clouds, the sunshine is scattered as it passes through such clouds reducing the total sunlight coming through and scattering more of it among the ice crystals in the cloud. This results in the solar disk being diminished in brightness, but appearing larger in the sky. This enlargement of the solar disk can substantially increase the time it takes for the turbine blade to cross the disk, adding many hours to the total shadowing. High thin clouds are a common occurrence

and cannot be ignored in the computation of hours of flicker.

Ward's evidence was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

These added hours will put many, and many more, residences over the 8-hour limit, requiring substantial mitigation and substantially decreased efficiency of the Facility, or denial of the application.

Proposed Factual Reasoning

AWE should have been required to consider, and include, Ward's additional hours of shadow flicker (Day 11, PM, and the MI brief of 18 November 2016) in their calculations. This exclusion should have been sufficient reason for the denial of the application.

Extended Argument

The overall question of shadow flicker was discussed in the testimony of Ward, cited above. In that testimony (not refuted, nor questioned either by AWE or the Committee), Ward stated that the SEC definition of Shadow Flicker will be met on many days when the solar disk is slightly obscured by high thin clouds. On such days, the clouds are sufficient to scatter sunlight, making the solar disk appear much larger, but somewhat diminished in intensity. This enlarged disk will offer the turbine blades substantially more minutes of Shadow Flicker. As Ward stated, this additional disk size, is not an uncommon phenomenon, and appears to have been ignored in the AWE calculation of the hours of shadow flicker. The additional hours of Shadow Flicker, when correctly calculated, will increase the hours of flicker at all the currently considered sites and add more affected sites to the list.

(Pictures of this enlarged solar disk appeared in Astronomy Magazine on page 18 of the February 2017 issue as well as on page 76 of the March 2017 issue of Sky and Telescope magazine)

Even if only peripherally required by the Rules to ensure the health and safety of the community (Deliberations, D2, PM, p7), referencing Site 310.08, the shadow from a gibbous to full moon will be very noticeable in winter, casting noticeable shadows from the turbine blades on all structures and snow surfaces, and causing very noticeable variations in light intensity inside bedrooms at night.

In the event that the Committee is reluctant to rehear these critical issues, and chooses to depend on post-construction monitoring and mitigation, it should require AWE to monitor flicker in real-time, and make available real-time electronic readouts to affected neighbors so that they may compare their real-world, real-time experiencing of moving shadows against the computer-generated data from AWE. The neighbors can choose to make videos, or collect other relevant data, and any such data must be evaluated by an independent, and qualified, third party. If this evaluation shows that the AWE computer-generated results are lower than the results from its neighbors, the facility must be shut down at all times of low solar elevation.

9 ERRORS IN O'NEAL REPLY TO WARD OF 28 September 2016

Error of Omission

There was no recognition, discussion or evaluation in the Committee deliberations of the gross errors in the 28 September 2016 AWE/O'Neal responses to Ward, and enumerated by Ward in his post hearing brief.

Ward's evidence was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

The Committee unlawfully decided that the O'Neal testimony of the pre-construction hours of shadow flicker was correct and relevant, when it was neither. It should have denied the AWE application.

Proposed Factual Reasoning

The errors and misunderstandings revealed in the O'Neal testimony and in his response to Ward showed that O'Neal's model results totally miscalculated the frequency of shadow flicker, and should have required the Committee to deny the AWE application.

Extended Explanation

The Meteorological Intervenors requested information on the AWE use of "Percent possible sunshine" on 20 September 2016, receiving the AWE response on 28 September 2016. The AWE response from O'Neal showed that he did not understand what the "percent possible sunshine" measured.

10 ERRORS IN AWE RESPONSE TO WARD OF 7 NOVEMBER 2016

Error of Omission

The Committee accepted, without recognition or discussion, the late AWE response to Ward dated 7 November 2016, which response was the complete AWE proposal for post-construction monitoring of shadow flicker. This AWE response/proposal uses thresholds for the key parameters of solar brightness and shadow depth that are both unsupported, and unsupportable. Realistic thresholds would likely lead to a denial of the application.

Ward's criticism was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

The threshold selection appears to lead to a very serious undercount of the actual number of hours of flicker, appearing to have been selected to give selected results. These miscalculated results should have led the Committee to deny the AWE application.

Proposed Factual Reasoning

The actual thresholds need to be vetted, either by competent experiments or from independent studies, neither of which AWE has supplied. Without such vetting the AWE proposal is irrelevant, and should be denied.

Extended Explanation

Based on the incorrect answer to their request of 20 September 2016, the Meteorological Intervenors propounded an additional question on 29 September 2016, the response to which was received on the final day of the hearings, 7 November 2016. This was the first, and only, time that AWE produced an explanation of the parameters they plan to use in the post-construction monitoring of shadow flicker. AWE defined the threshold levels for the brightness of the sun and the depth of the shadow necessary to produce a noticeable flicker. **THESE THRESHHOLDS ARE UNBELIEVABLE!** The solar brightness level and the shadow depth are set to eliminate a large fraction of the days that would qualify for flicker, leading to a gross underestimate of the hours of shadow flicker. It should be noted also that this method for defining shadow flicker is totally unrelated to the O'Neal (pre-construction) method referred to in the 28 September 2016 response to the Meteorological Intervenors. The conclusion to be drawn from these responses is that there is no viable plan for determining the post-construction shadow flicker, and the pre-construction model calculations are a dream, not a reality.

11 AWE Errors from Meteorological Ignorance

Error of Omission

There was no recognition or discussion in the Committee deliberations of the serious meteorological effects arising from the strong correlations between wind directions, wind speeds and other meteorological factors. Ignoring this correlation led to an erroneous increase in the correction (of the astronomical hours of shadow flicker) required to determine the meteorological hours of flicker, and thence to an erroneous decrease in the pre-construction calculation of the hours of shadow flicker.

Ward's evidence was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

The AWE model fails to account for the correlation between the two, and therefore undercounts the hours of flicker, falsely making the data appear to meet the SEC threshold. The real correction would have led the Committee to deny the AWE application.

Proposed Factual Reasoning

A proper calculation of shadow flicker would put the hours of shadow flicker in many places over acceptable limits, leading to a denial of the AWE application.

Extended Explanation

In Meteorology 101, students learn that the sun shines through clouds. Even on the cloudiest day, the ground temperature rises from the early morning to midday. This means some solar radiation hits the ground even on the cloudiest days, and more radiation gets through the thinner clouds. One obvious result is that an instrument set to measure sunshine will receive some sun, no matter the clouds, or how much of the sky is cloudy. This means that instruments that measure sunshine will not necessarily agree with instruments that measure cloudiness. The data from one of them cannot be added to the other (as O'Neal did in his 28 September response to Ward). Another Meteorology 101 fact is that the sun shining through thin clouds acquires a hazy outline from the reflections and refractions of the cloud particles. The solar disk spreads out, and the apparent disk size increases. This enlarged solar disk will necessarily allow for more hours of shadow flicker on some days, adding substantially more total hours of shadow flicker.

The second realization of students in Meteorology 101 is that almost all meteorological data are correlated with other meteorological data. This precludes treating such highly correlated data sets as if they were independent, as O'Neal does with the meteorological correction for the astronomically calculated sunshine data, assuming the wind direction and cloudiness are independent.

12 No Accounting for Reflection Shadow Flicker

Error of Omission

No recognition, discussion or evaluation by the Committee in their deliberations of the effects of ground reflections and ground shadows. The AWE model does not account for such reflections and shadows and leads to a serious undercount of the hours of flicker. The ground surface in Antrim for many months of winter, will be covered with bright, white snow, often with a smooth ice surface. In addition, the ground cover surrounding the Antrim site is mostly deciduous, without foliage for seven months of the year. As seen in a satellite picture from space, or as would be seen by an observer atop Tuttle Hill or Willard Mountain, this view shows very limited obstruction to either light or sound waves. The shadow flicker produced by shadows reflecting off bright and reflective surfaces will produce substantial, and very noticeable, and added, flicker.

Ward's evidence was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

The result of this gross oversight is to substantially underestimate the shadow flicker to the neighbors, increasing the actual hours of perceived flicker inside homes and with a resultant denial of the AWE application.

Proposed Factual Reasoning

The winter calculation of shadow flicker must use "winter" ground cover and assume "winter" surfaces, including reflections from reflective surfaces.

Extended Explanation

Nowhere in the deliberations did the Committee recognize or discuss the well-known winter effect of reflections from ice and snow. The Antrim area experiences 7 months of winter in the form of bare

deciduous vegetation. Antrim also has about 4 months with snow cover, and many days with an ice-coated snowpack. On some of these days, the shadow flicker will bounce right off this snow/ice coat and into neighbors windows, with little lost brightness. The reflected sunlight cast flashing lights all over the area

13 NO WORST-CASE ANALYSIS OF TURBINE NOISE

Error of Omission

No recognition, discussion or evaluation in the Committee deliberations of the requirements of Site 301.18 (c) (3) and Site 301.14 (f) (2) to conduct a “worst case” analysis of sound levels.

Ward's evidence was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

The model noise results (ISO 9613-2) presented by O'Neal were for “moderate downwind conditions”. The Committee members never acknowledged, nor did AWE point out, that this limitation excluded the “worst cases”. Moreover, Ward (Day 11, PM, p197) pointed this out, and there was no cross-examination by AWE (p 223), and no questions from any member of the Committee (p223). They let stand Ward's assertion that “they (AWE) never did it (determine the worst case)”. And Ward (p 197) “worse than that, they (AWE) never acknowledged that they didn't do it, or tried to find out what the meteorology was that would produce the worst case noise”. This neglect led directly to the statements by member Clifford (Deliberations, Day 2, AM, p82) “they did assume worst case directions, wind speeds”, and Clifford (Deliberations, Day 2, AM, p90) “sound assessment was prepared in accordance with professional standards”. Both of these statements are at variance with the (silently assented to) statements of Ward, noted above, and totally ignore the blatant omission of the requirement stated in 301.18 (c) (3). There is no way that AWE can mitigate rapidly enough, if at all, without that information, and its omission (assented to by the silence of both AWE and the Committee members) is more than sufficient reason for denying the application.

Proposed Factual Reasoning

The Rules clearly state that a “worst case” analysis or a “shall not exceed” is required. AWE is required to do the proper analysis to demonstrate that they meet these requirements. The silent assent to Ward's testimony, by both the AWE attorney and the members of the Committee, required a denial of the AWE application.

Extended explanation

There are many references to the severe limitations on its application to the question of “not-to-exceed” in ISO 9613-2. A few examples are “the equations given in Clause 7 are the average for meteorological conditions within these limits” on page 3, “These equations also hold ... for average propagation” on page 3, and “Restricting attention to moderate downwind conditions of propagation.....limits the effect of variable meteorological conditions on attenuation to reasonable values“ on page 13. Yet at some subliminal level, member Clifford, in his statement on Deliberations Day 2, AM, p82, said “They did assume worst case” acknowledged his MISunderstanding that O'Neal's results were, in fact, “worst case”. The lack of any dispute by other members to that remark, showed rtheir assent to Clifford's MISunderstanding. The AWE post-hearing brief (p 54) said “it allows for calculation of the theoretical 'worst case’”. But the value of that worst case was never presented.

The only information of relevance to the often stated “not to exceed” requirement in the Rules is not the average results, but the extreme results. The worst case is not the average case, it is one of the non-average, or extreme, cases. Since O'Neal only dealt with the average cases, and his results were just short of the SEC limits, many/most of the non-average cases must be well over these limits. Since these worst case will be of limited duration, and mostly late at night, what is a neighbor's

response when woken up? Does she call and then go back to sleep? The noise will often end by the time anyone at AWE even figures out how to mitigate.

14 NON-RECOGNITION OF MITIGATION ON EFFICIENCY

Error of Omission

There was no recognition, discussion or evaluation by the Committee in their deliberations of the operational effects, and the resulting derogation of the efficiency of the entire project, including its finances, from the proposed AWE mitigation procedures. All mitigation reduces efficiency, and the extended spin-up, spin-down times will be a large factor in their mitigation, and need to be addressed. The entire facility could be turned off, if necessary, so using mitigation as an all-purpose excuse is not sufficient, without an analysis of its frequency and effects. The Committee never asked for the spin-up and spin-down times.

Ward's evidence was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

The sum of the derogation of efficiencies due to all the proposed mitigation procedures appears to be substantial. The timing of these mitigations will necessarily be at the times of maximum generation, resulting in measureable decreases in the overall efficiency of the facility. The SEC needs to require an analysis of all the proposed mitigations, and the effect of each, on the overall efficiency of the project, before approving the AWE application.

Proposed Factual Reasoning

The applicant must determine the total losses of output due to mitigation, and the extent to which such derogations of efficiency might lower the project efficiency below a viable level.

Extended Explanation

The Committee agreed to the AWE assertions that each and every possible violation of the "do not exceed" Rules could, and would, be mitigated by a slight modification of the operating procedures. However, these facile responses were never supported by an evaluation of the losses in efficiency from such mitigations. There was no evidence produced by the AWE agreement to idle one or more turbines due to excessive noise, no way to determine which turbine(s) violated its limits, the length of time required for the shutdown, no determination of the frequency of such shutdowns, etc. Moreover, a shutdown of a single turbine involves not just a few minutes, but must include the times for the turbine to spin down and to spin up. The Committee never asked for the relevant data. The net is that AWE presented no data as to the reduction in operating efficiency from all the necessary mitigations. There was also a paucity of data from AWE as to the actual methods to be implemented to track and verify the times for mitigation.

The mitigation processes are very different for flicker than for noise. Since most noise excesses will be of limited duration, mostly a few hours, responses to a "do not exceed", mitigation cannot wait for the excess to develop, it must be implemented on a forecast, but need not completely shut down a facility or a turbine. It can be ended on a forecast too. The mitigation must be ready to go before the noise exceeds its limits and must be implemented very rapidly. Mitigating sound must be immediate, requiring advance notice from an analysis of the expected meteorological worst case(s). Mitigating shadow flicker will require an extended spin-down, spin-up time, during which period the blades will still be flickering the sun.

15 NO CONSIDERATION OF OTHER HAZARDS

Error of Omission

No recognition, discussion or evaluation by the Committee in their deliberations of the effects of

shadow flicker and sun glint on the serious accident potential of drivers on adjacent roads. One of the criteria for acceptance of the AWE application is in 301.16 (j) under "public health and safety". Ward's evidence was undisputed by both the applicant and the Committee members, therefore it constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

The issues of the effects on public safety arise from the coincidence in the timing of shadow flicker, at dawn and sunset, with low sun angles, also at dawn and sunset. This combination would be particularly deadly on the eastbound sunrise traffic on Route 9 in Stoddard. It should require shutdowns during particular months of the year. AWE never acknowledged, nor did the members of the Committee acknowledge, by question or comment, that such a hazard existed. Such an oversight flaunts the requirement of 310.16 (j) and is reason for denial of the AWE application.

Proposed Factual Reasoning

This effect and its consequences must be calculated and evaluated prior to acceptance of the AWE application.

No Extended explanation

16 NO DETERMINATION OF ICE THROW LIMITS

Error of Omission

No objective evaluation by the Committee in their deliberations of the likely distance that ice sheets can be hurled from turbine blades, the tips of which move at 100 meters per second. This means that an ice sheet ejected at the top of the blade, 150 meters above the ground would cross the (250 meter) facility boundary in 2-3 seconds from ejection. The Committee blithely accepted the AWE assurance that no ice has been found beyond 200 meters from the blades. In addition, none of Ward's comments on the subject were considered, or quoted, in the final Order. Absence of evidence is not evidence of absence.

Unlawful Order

This unconcern for the effects of sheets of ice sailing downhill allowed the SEC to approve the AWE limits, when it should have led directly to a denial of the AWE application. .

Proposed Factual Reasoning

The applicant must conduct a comprehensive survey around a similar facility, and include a simultaneous meteorological study to determine the conditions under which such ice throw will likely occur and the preferential directions of throw. Any such study must then be adjusted for the larger turbine blades at AWE. Lacking this study, the committee must deny the AEW application.

Extended explanation

Every competent meteorologist knows that at sea level, icing is infrequent. He also knows that icing is very frequent atop 6000' Mt. Washington. But there are little data on the frequency of icing at the 2000' elevation of the AWE turbine blades. Was it ever measured on the Tuttle Hill met tower? That data would be relevant to these proceedings, but the Committee has never requested it be made available for study. Icing is interesting in that it will occur only under limited meteorological conditions, and its throwoff will occur under a different set of meteorological conditions. Both conditions will be very dependent on the wind direction. The shapes of these ice ejections will likely be thin sheets, potentially sailing long distances, DOWNHILL. AWE must know the shapes of the ejecta, and should know the preferential wind direction for accumulation and ejection. Any attempt to determine the frequency of ejection and the shapes of the ejecta should begin with a search downwind in the preferential direction. However, the assertions of AWE that there will be no ejecta more distant than 200 meters from the turbine, without some additional information, is unwise, and potentially dangerous. ABSENCE OF EVIDENCE IS NOT EVIDENCE OF ABSENCE!

17 FLASHING LIGHTS and THEIR EFFECTS

Error of Omission

The glib acceptance by the Committee (Deliberation Day 1 PM, p53) of the AWE proposal to use a radar program to limit the flashing lights at night, without any attempt to get the vital information on the total time, and/or times, during the night which will require lighting, including the flight paths around nearby airports, the altitudes at which these paths cross the Antrim area, and the effect of drones on initiating lighting, was breathtaking. In addition, there was no discussion of the health effects of such lights, nor of the health effects of repetitive occurrences of flashing lights in interrupting sleep. If continuous flashing lights are a problem sufficiently serious to require the radar system, then they must also be a problem during the intervals when they are ON during the night. These omissions made their discussion, and their acceptance of the AWE application, a violation of the Rules.

Unlawful Order

The substitution of any discussion of the flicker effect of the nighttime lighting on the turbines, by referring to the FAA approved radar detection system, allowed the Committee to overlook the serious possibility of repetitive and noticeable shadowing of bedroom windows. This shadowing, its frequency, and its seriousness could/should have led to a denial of the application.

Proposed Factual Reasoning

The Committee needs to require AWE to determine how noticeable this flicker will be, and if noticeable, add these flicker hours (to those regularly computed from low sun angles) in the determination of whether the facility meets the shadow flicker, 8-hour, threshold. The Committee also needs to get the medical data on nighttime flickering, which could be substantially different from daytime flickering.

Extended Explanation

The Committee was misdirected by the applicant into agreeing that a radar-controlled system to allow the lighting to be turned off when aircraft are “near”, “solves” the flashing light problems. It does not! And does “near” differentiate between height and horizontal distance? The Committee agreed to this system with no discussion or questions as to how often the lights would be left on, and how much of an effect the lights would have on their neighbors sleeping habits. When on, these lights are very bright, required by the FAA to be seen for many miles all around. Yet the Committee assumed, since there was a mitigation system in place, that during the “lights-on” times, all would be right with the world. The Committee could NOT make this assumption without an extended discussion and questioning of some basic information. This information had to begin, not end, by seriously determining whether the AWE facility was a “nuisance” when these bright, flashing lights were on. No one disputed that there was not a problem when off. But these bright, flashing lights will be seen from long distances and are bright enough to cast shadows on the structures, AND INTO THE BEDROOM WINDOWS of the dark neighborhood. The human eye detects a very wide range of brightnesses, over a factor exceeding a million! That it can detect color in the range of brightnesses between the sun and the moon, speaks eloquently as to this sensitivity. Anyone within miles of these lights will be aware of their existence. This flashing awareness on a bedroom window will be easily noticed, and be quite similar to a reverse shadow flicker, more than enough to awaken many sleepers. They may be off most of the night, but how many awakenings during the night are required to ruin a night's sleep???? In my stargazing at night, there are frequent flashing red lights from planes passing overhead. There was no evidence as to the height at which such planes will trigger the radar.

There is nothing in Appendix IV that describes the radar-controlled lighting system. There is one short paragraph in the Order, but that paragraph also does nothing to describe the system. There remains nothing to indicate how serious and how frequent these bursts of light will be. It is noteworthy however, that a simple look at the sky over Antrim shows lots of contrails from planes passing within a

few miles of Antrim, meaning that the Antrim skies are on frequently used flight paths, day and night. How far away can a plane activate the lights? How long will they stay on? At what height will a plane turn the lights on? These questions were never asked, discussed, or answered in the Hearings or Deliberations, and were flown by the Committee at supersonic speed, in their Order.

18 WHAT WOULD MAKE AN UNREASONABLE VISUAL EFFECT

Error of Omission

No recognition, discussion or evaluation by the Committee in their deliberations of the level at which the parameters which impact the visual effect of the facility rise to the level of being “unreasonable”. Since the Committee approved the facility, they must have concluded that its size, location, prominent elevation, noise, flashing lights, etc., either singly or in combination, did not rise to the level of being unreasonable. That begs the question of how prominent would any one, or combination, have to be, to be “unreasonable”. There was no discussion of the thresholds at which any single factor, or any combination thereof, needed to be exceeded. Lacking such determinations, it is impossible to agree to, or dispute, the Committee's subjective determination. Raphael's repeated failures to set such thresholds during his cross-examination by Ward constitutes the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

Ignoring the big picture led to the approval of a facility which dwarfs its landscape and overpowers passersby with its continual “look at me, look at me” by its big motions, big changes over time, loud noises and flashing lights. The data on advertising billboard assessment criteria presented by Ward (Ward pre-filed testimony, 21 May 2016, Reference (a)) were never acknowledged nor deliberated. The Committee's approval suggests that questions of how huge, how overpoweringly tall, how much motion, how much noise would be “unreasonable”, are for the future, especially in light of the planned larger turbines. Such casual consideration cannot be the basis for a lawful approval.

Proposed Factual Reasoning

The Committee should first have acknowledged that 8 ½ x 11”, still, silent, unchanging photographs of a facility which is huge, constantly in motion, noisy, with flashing lights, and presenting a different face every time it's observed, display only a tiny facet of its visual impact. The factors listed in Ward, above, required the Committee's acknowledgment and discussion prior to any approval.

Extended Explanation

Every meteorologist is trained to describe the salient features of the atmosphere around him. The order of descriptors, from important to negligible would be Size, Height, Direction and Speed of Motion, Flashing Lights, Noise, Rapidity of Change, and maybe its Brightness and Color. The fraction of the view across which the facility is spread, its lights and noise are all considered in the construction and placement of outdoor billboards. Billboards are the ultimate, and most relevant, substitute for the projected facility presented to the Committee. An instruction manual was presented to the Committee by Ward, which directed billboard assessors to evaluate all these same characteristics. It was ignored, without discussion. Such discussion, had it occurred, would have driven home the enormous visual impact of a facility which extends miles along an elevated, and isolated horizon, is in constant motion, shows ever changing faces to its viewers, makes noise, has flashing lights, etc. Comparing its visual impact to the present pristine hillside requires acknowledgment of all these characteristics. Not one of them can be gleaned from an 8 ½ x 11” still photograph.

In the face of all this reasonableness, it is fair to ask, what singly, or combination of these sensory effects, would be judged unreasonable? Would larger blades do the job, a site on Mt. Monadnock, a blazing billboard with flashing images, or a big band music revue? Larger blades are on the horizon, is there any limit? There are only a limited number of high ridges in New Hampshire, and any serious

contribution by wind energy will require using all of them. The Committee needs to state what limits they deem reasonable if a huge, noisy, prominent lighted facility is not!

Since the Committee has determined that impact of the present proposal is not unreasonable, it's appropriate to ask what changes would make it unreasonable.

Would a longer facility, stretching 5-10 miles along the ridge be unreasonable?

Would turbines 1000 feet in diameter be unreasonable?

Would a more isolated and elevated site such as Mt. Monadnock have an unreasonable visual impact?

Would louder noise issuing from the proposed facility make an unreasonable impact?

Would brighter flashing lights be an added "attraction?"

Did the Committee ever ask about what would trigger the flashing lights? Would the direction of the plane with respect to the facility matter? How high does the plane need to be to avoid such triggering?

What about drones. etc?

How much do noise, flashing lights and motions exacerbate its visual impact?

We'll never know, because in the long discussions of visual impact, the Committee never put a limit on the size, noise, light, etc that they would have considered unreasonable.

The comment on page 116 of the Order, completely misrepresents Ward's position and testimony. It also omits the bases for his testimony, and his critical cross-examination of AWE witness Raphael.

19 IGNORING NIGHTTIME VISUAL IMPACT

Error of Omission

The Committee, in their deliberations of visual impact, did not consider the visual impact of the facility during the nighttime hours, even if the facility had a radar-activated lighting system (ADLS). The Committee assumed (without evidence or deliberation) that there is not enough light to see the facility. This was a gross error! (Deliberations Day 1, PM, p53-60).

Unlawful Order

These oversights by the applicant and the members of the committee required additional discussion by the Committee. The nighttime visual impact is not zero! It cannot be ignored! A strong case can be made, but wasn't, that the markedly increased visual sensitivity, and the lowered ambient sound levels at night, exacerbate the visual impact of a facility which is always partially lit by skyglow, moonlight, and flashing lights, and moves and makes noise. The nighttime visual impact must be evaluated prior to any approval of this facility, which incidentally will increase in the number of hours of shadow flicker.

Proposed Factual Reasoning

The nighttime visual impact of this facility must be a major factor in its approval and requires extended discussion prior to approval. The shadow flicker from the wintertime full moon will add significant hours of noticeable shadow flicker.

Extended explanation

The inclusion of ADLS merely reduces one obvious nighttime visual impact of this huge facility, but by no means all. The Committee's conclusion would have been faulty even if there were no flashing lights on the facility. The facility will be prominently visible at night due to moonlight, which moonlight will be a factor on at least 25% of the nighttime hours. In addition, in the winter months, when the full moon is high in the sky, the week around full moon, especially with snow cover, the facility will present a very strong visual face, and the moon will cause substantial shadow flicker when rising and setting. Flashing lights add a strong, and very different impact. These two effects could have led the Committee to conclude that the nighttime Visual Impact would have been MORE serious than the daytime one. And the 7-month lack of foliage allows an impressive view. The comment noted above is

simply erroneous and allowed the Committee to completely overlook this issue.

The rapidity with which the Committee agreed to the radar system, without the key details of the system, including the frequency with which these lightings are likely to occur, is irresponsible. Is there really any difference in constant nighttime flickering, and “only” a dozen flickerings during the night? A further Omission by the Committee, but which would be very much on the minds of any nighttime visitor to Lempster, is the brightness of these flickering lights. At night the human eye becomes extremely sensitive, especially when sleeping. Lempster-type lights will cast a (reverse) flicker on the windows of many neighbors. A light/dark/light flicker in daytime will be replaced by a dark/light/dark flicker at night, equally annoying.

20 TIPPING the SCALES of JUSTICE

Errors of Omission

Little recognition, discussion or evaluation by the Committee in their hearings and deliberations of the many pieces of evidence presented by the Meteorological Intervenors, which evidence directly contradicts testimony and evidence presented by AWE witnesses, principally Mr. O'Neal. The Committee never weighed, nor chose between, the contradictory evidence. It simply overlooked the Meteorological Intervenors' evidence and testimony. This is in violation of the Committee's Rules of Procedure. This evidence covered noise, shadow flicker, icing, and other potential problems. By overlooking these criticisms, and deferring to O'Neal's (questionable) competence in every dispute, the committee never took the opportunity to vet O'Neal's assertions.

Ward's criticisms were undisputed by both the applicant and the Committee members, and therefore constitute the preponderance of evidence under Site 202.19 (a) and (b).

Unlawful Order

Ignoring the meteorological evidence presented by the Meteorological Intervenors, both written and oral, allowed the Committee to approve the AWE application, despite its failure to meet many standards set in the Rules. Serious consideration of Ward's fundamental criticisms of O'Neal's testimony and data should have constrained discussion of O'Neal's testimony, and should have totally changed the deliberations by the Committee. The final Order was merely a repetition of wrong evidence, with large, and unexplained gaps.

Proposed Factual Reasoning

The meteorological evidence showed that the AWE proposal failed to meet many of the requirements in the SEC Rules, and the application should have been denied.

Extended Explanation

The Meteorological Intervenors have over two centuries of professional experience, and participated pro bono. In view of the many errors and misunderstandings by O'Neal, the Committee's strong preference for O'Neal is difficult to understand, and raises many questions. The AWE responses of 29 September and 7 November 2016 to Ward's requests for information demonstrated that O'Neal did not know how percent sunshine was calculated, and the second AWE response was a 100% change from the first, despite it being the only AWE description of their post-construction plans.

One of the more interesting “omissions” was the lack of cross-examination of Ward by AWE counsel, particularly its omission of responses to Ward's criticism of O'Neal's testimony, particularly on shadow flicker and noise. This lack of cross-examination by AWE counsel, and the absence of rebuttal testimony by AWE, must be considered as acceptance of Ward's testimony. In addition, the lack of any questioning by the members of the Committee must be understood as their acceptance of Ward's criticisms. This lack of responses by both AWE and the committee is equivalent to dispositive acceptance of Ward's conflicting testimony. In addition, the Committee never acknowledged the

meteorological data presented by Ward, which showed O'Neal's primitive, and inaccurate, knowledge of the weather data he used in his models.

The total lack of discussion of Ward's fundamental criticisms of O'Neal, and the acceptance of O'Neal's analyses and conclusions, without consideration of Ward's refutations, flies in the face of the Committee's obligations as stated in the many "shall consider" and "shall apply" in the Rules of Procedure. It even goes beyond the weight of evidence. The record shows that the Committee ignored the evidence submitted by Ward, whether Ward was right or wrong. If Ward was correct, the record shows that the pre- and post-construction noise levels will exceed the 40/45 Db levels on many nights of the year, and the shadow flicker will substantially exceed the 8-hour limits at the receptors O'Neal studied, and at many additional receptors,. The icing will pose a continuing risk to life and limb for the neighbors, hikers and visitors.

Dr. Richard Hendl
Dr. Joseph D'Aleo
Mr. Robert Copeland
Mr. Bruce Schwoegler
Dr. Fred Ward