From: drfred@myfairpoint.net [mailto:drfred@myfairpoint.net]
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To: Murray, Jane
Cc: Rick James; Lisa Linowes; Lori Lerner; Kris Pastoriza; Snow Star Farm; Geoff Jones; John Halter; Steve McGerty; Margo Santoro; Dian Mathews; John Halter
Subject: SEC Docket 2014-04

Mr. Martin P. Honigberg, Chairman 14 September 2015 Site Evaluation Committee
21 Fruit Street, Suite 10
Concord, New Hampshire 03301-2429

Dear Mr. Honigberg:

These are my suggested revisions to the Draft Final Proposed Rules on SEC Docket 2014-04.

Meteorology is the biggest factor affecting the visual impact, the noise generation and broadcast, the shadow flicker and sun glint, the icing, and last but not least, the problem of the synchronization of the winds over large areas and their resultant large electric surges.

The question of visual impact was presented, and discussed by both sides, as if the view was always, or even often, in sunny weather, with blue skies and all turbines facing orthogonal to the viewer. Is that the picture that demonstrates their maximum visual impact, or even their general visual impact? The weather will determine who will be the most, and most often, affected by their visual impact, which will be a unique combination of wind direction and visibility.

As to noise, ISO 9613-2, the "standard model" everyone quotes, has very interesting comments in Clause 5 "Meteorological conditions" and Clause 9, "Accuracy and Limitations". The net of these comments is to state that ISO9613-2 CANNOT be used to calculate the noise from an elevated, isolated sound source!

As to shadow flicker, 30 hours a year doesn't seem like much, but 30 hours per year is FIVE MINUTES OF FLICKER ON EVERY MORNING OF THE YEAR, FOREVER! And that leaves aside its deadly effect on drivers on our highways. More importantly, I cannot determine whether the model for calculating the hours of flicker takes into account the elevation differences between the turbine and the receiver, or the substantial increase in the brightness of the sun.

ISO 9613-2 is the poster boy demonstrating that the SEC must require any testimony which uses the results from "models" to produce both the model and the data used in it, prior to testifying, so that attendees can test and verify both its accuracy and relevance. The "uncertainties" discussed above must be disclosed, and accounted for in any "models" used to demonstrate compliance under worst case conditions. Assuming models are accurate predictions is naive. The topography of hills or ridges are very different from one another, and these differences have substantially different effects on the winds blowing across them. These different meteorological and topographical effects change their visual impact, their noise generation and broadcast, their shadow flicker, their sun glint and their icing.

Below are specific revisions and additions to the draft designed to address these meteorological concerns. I am gathering other meteorologists to support the pressing need for competent meteorological input, and will urge you to invite, this group as intervenors, strictly for the purpose of ensuring that these concerns are properly addressed in future hearings.

The meteorological information from public sources indicates that the Committee will have to require the applicant to perform substantial on-site meteorological and topographical analyses prior to any hearings, to ensure that any models, and measurements, pass the tests of accuracy and relevance.

Turning to the specific comments and recommendations:
301.03.....
Add to 301.03 (f) (5) "including the effects on the ISO of the temporal synchronization of wind turbine operations".

Add to 301.03 (h) a new (3) "and that notice of this information session has been widely publicized in adjacent communities".

Add to 301.03 (h) a new (4) "and any adjacent communities"

301.04.....
Add to 301.04 (b) or 301.13 (b) a section (3) "A complete description, including limitations and tolerances, of any technical models used to justify their application, or used as substitutes for actual measurements of the expected meteorological effects of this facility, on its visual impact, noise generation and broadcast, shadow flicker, and icing and throwoff, and the meteorological and topographical data used in such models."

301.05.....
Add 301.05 (b) (6) Add (i) "The elevation of the turbines above the elevation of any observer."

The phrase "looking up" to something or someone has meaning. It connotes someone or something of higher status, and/or higher visibility. The SEC members sit on raised daises, as do judges. The reason for this elevated status is lost in history, but the effect is more than just a height difference. Officials on an elevated dais are easier to see. Their "visual impact" is raised by their elevation. In meteorology, the definition of "visibility" is "horizontal visibility", and the reasons are fundamental to this present issue. There are many days on which the horizontal visibility is less than one mile, but the (elevated, isolated) sun is quite visible, 93 million miles away. It is a well known fact in meteorology that the visibility rises with elevation above the observer, and the visual impact of a distant object rises with increasing elevation above the observer. Whether this effect of elevation is just a physical effect, or is added to the psychological effect is not known. The relevance to the present issue stems from the fact that the visual impact is the total height of the top of the blades above the observer, not their height above the base. The bottom line is that the visual impact of an IWF will be more, much more, than is listed in section 301.05, due solely to the elevation difference between the facility and the observer, i.e. the sum of the tower height, PLUS the difference in elevation between the top of the hill and the surrounding land.

Add 301.05 (b) (6) Add new section (j) as follows "The effect of the elevated and isolated nature of the facility, including its increased prominence, its meteorological visibility, and the added visual impact of its flashing lights, blade motion, and noise".

Add 301.05 (b) (7) Add sentence at end of paragraph "A video, comprising 1000 ten-second sections, randomly selected, day and night, sunny and cloudy, all kinds of weather, and sunrises and sunsets."

The rapidly changing meteorology of the hill leads to an additional problem, which has been neglected in the hearings. There is no one, or limited set of, photographs which can describe the visual impact, of an IWF. The view is constantly changing, not only by the rotation rate of the turbine blades, but their orientation by the wind, the unsynchronized flashing lights, the reflections and shadow flicker off the blades, etc. Each time an observer looks at the facility, he/she will see a different picture, so how will anyone judge the visual impact of the facility from any photograph, or set of photographs of a constantly changing, moving, structure, with flashing lights and noise?

301.07 .....
Effects on "the natural environment" covers only effects on wildlife and plants. Humans inhabit our natural environment, and are its stewards as well. Our natural environment is quiet, sunlit and moonlit, but otherwise dark. We don't see much motion, or flashing lights, or hear much noise at night. The effects of an IWF on other parts of the natural environment are noted in the previous section, but also apply here, and require RElisting.

301.08 .....
Replace everything in 301.08 (a) (2) after "roadway" and before "astronomical" with "based on a model with no maximum distance and accounting in the 'anticipated hours per year' for the difference in cloudiness and solar intensity resulting from the differences in elevation between the turbine and the observer. The distance from the turbine over which this model should extend will be determined by a study which includes blade width and the effects of the increased intensity of sunlight due to the elevation differences."

The geometry of shadow flicker is quite simple, but 301.08 (a) (2) skips over the geometry. The key number is the blade obstruction as a fraction of the apparent solar disk. The apparent solar disk remains constant as you move away from the turbine, but the turbine size and blade dimensions decrease linearly with distance. That causes the fraction of the sunlight blocked by the blade, and the fractional loss of solar intensity to diminish, eventually reaching a point at which the light diminution by the blade is undetectable. Since it is reasonable to assume that the blade obstruction (width) increases as the blade lengthens, "an impact distance of one mile", for all blade lengths, and widths, is irrelevant. In addition, the models of "the anticipated hours per year" appear to assume that the turbine and the observer are at similar elevations. If so, the calculation for an elevated source will always be woefully underestimated, as will the intensity of the shadow.

Add to 301.08 (a) (4) "An assessment of the meteorological factors, particularly the wind direction, which determine both the icing accumulation and its throwoff."

Since icing and its throwoff will be almost totally dependent on the wind direction, this section should require the applicant to determine which wind directions, and hence which neighbors, will be commonly affected.

In 301.08 (a) Add a new section (10) "A demonstration that the facility will not interfere with the weather radars used for severe storm warnings, and will not interfere with any local weather radars."

301.14.....
In 301.14 (a) (6) Add "'Prominent feature' is to be defined to include the multiple interactions of the visual and aural effects emanating from an elevated and isolated site, and the added interactions imposed by the motion and flashing lights, which interactions reinforce each of these separate factors."

In 301.14 (f) (2) (b), change 30 hours per year to a much smaller number. IWFs always stress the much lower "anticipated" number calculated from a model which woefully underestimates both the hours of flicker and their intensity from an elevated, isolated facility. Add a requirement that proper control systems be part of all purchased wind turbines and used to protect properties and roads.

30 hours per year1800 minutes per year, 5 minutes each and every day, forever. No one should be subject to such torture.

301.14 (f) (2) (c) Replace both references defining "turbine tower height" as measured from base to tip with "as measured from the tip of the blade in the vertical position to the elevation of the land at 3 times the tower height.

301.16.....
Add (f) "The maximum surges in output from the facility, their frequency, time of day, the ability of the ISO to effectively utilize these surges, including the deterioration of turbine efficiency, their effect on other sources of power, and the potential effects of future IWFs on the grid, assuming that all such present and future IWFs will surge on the same days and at the same times."

An Industrial Wind Facility (IWF) operates with turbines which produce about 1/3 of their rated output. That means they will supply somewhere between 0% and 100% of their capacity, but will average only 1/3 of that capacity. This large difference between their maximum output and their actual output means that the electric grid must be able to accept, and use, large surges. The only way to "accommodate" such surges is to curtail either these wind surges or shut down other suppliers. The first would seriously reduce the efficiency of IWFs. The second would necessitate shutting down base load suppliers, the cheapest and most reliable of sources. A simple analysis of wind data in the US shows that wind speeds are highly synchronized over very large areas. This means that when one IWF is producing lots of energy, all the others, within a few hundred miles will be too.

301.18.....
Omit all 301.18 (c). Replace with "ISO 9613-2 cannot be used. The applicant will determine from actual measurements at the proposed, or a similar, site the meteorological conditions which are likely to produce the 'worst meteorological case(s)' for sound generation and broadcast, and the direction(s) which will be most affected. The applicant will then determine, based on sound meteorological principles and analyses, the sound levels to be expected at the site, for the 'worst meteorological case(s)', and their frequency of occurrence." If ISO 9613-2 is used, it must add at least a 10Db meteorological and topographical uncertainty

ISO 9613-2, the "standard model", has very relevant comments in Clause 5 "Meteorological conditions" and Clause 9, "Accuracy and Limitations". In Clause 9, for example, it says "Restricting attention to moderate downwind conditions of propagation, as specified in Clause 5, limits the effect of variable meteorological conditions on attenuation to reasonable values". "Moderate downwind conditions" are NOT the ones that produce the loudest noises, nor the widest broadcast of noise. There are other troubling limitations, sound propagation is not considered as coming from an isolated, elevated ridge, the sound characteristics of which are (as also stated in ISO 9613-2) unknown.

ISO 9613-2 defines "Cmet" as an added effect of the weather. But Cmet equals "Co" in most cases of interest. ISO 9613-2 defines "Co" as a factor, in decibels, which depends on local meteorological

statistics for wind speed and direction, and temperature gradients". The bottom line, no one knows what the Cmet "bugger factor" is! So why would anyone make noise measurements except at times when the "worst case" weather conditions pertain, assuming that anyone knows what the "worst case" weather actually is! Other noise measurements are just that, statistical NOISE. Either the measurer doesn't understand meteorology, or is deliberately trying to mislead.

Summary.....
The point of all the above comments is to add meteorological considerations which are more important to the decision to approve an IWF than many of the other concerns which are listed in excruciating detail, possibly to give the impression of concern for neighbors, but just camouflaging the real effects.

Dr. Fred Ward
386 Route 123 South
Stoddard, NH 03464
drfred@myfairpoint.net
446-2312