

**From:** Tomlinson, Gary (ENE)  
**Sent:** June 29, 2009 9:17 AM  
**To:** Low, Victor (ENE)  
**Cc:** Bardswick, Bill (ENE); Glassco, Jane (ENE)  
**Subject:** RE: Multiple Wind Turbine noise level measurement  
Victor:

I will be addressing the issues that GDO has/is experiencing with the Canadian Hydro Developers operation in Dufferin County in the order of your questions to Jane Glassco.

In short, the most pressing and immediate issue is that Certificates of Approval (Air) have been issued for wind turbines with noise emission compliance limits specified in the approval. MOE currently has no approved methodology for field measurement of the noise emissions from multiple noise sources. As such there is no way for MOE Field Staff, (and I would submit anyone else), to confirm compliance or lack thereof with the noise limits set in the approvals.

GDO Staff are scheduled to meet with Township of Amaranth staff during the week of 10 August, 2009 to discuss this matter, as well as meet with Amaranth Council on 19 August, 2009 to discuss CHD's compliance with it's approval(s) specifically as they relate to noise emissions from the transformer station and most importantly the multiple wind turbines located in the Township. I would be hard pressed to believe that the issue of ability to measure noise emissions from multiple sources to determine compliance will not come up as one of the items of discussion at that time.

A slightly more in depth response to your questions follows:

#### **Step up Transformer Station Issues**

The first set of complaints relate to the operation of the step up transformer substation located to the south and something like 6 km away from the main part of the wind farm. These complaints are also divided into two main types.

The first subset of transformer complains run as follows:

The complainants state, and GDO Staff have confirmed, that the noise emissions from the transformers, (primarily at night), are considerably above the normal nighttime ambient noise levels previously encountered in that area. (GDO Staff measurements utilizing the NPC-103 methodology, confirm that when the transformers are not operating, the normal nighttime background ambient noise level varies between 27 and 29 dBA. When the step up transformers are operating, the noise levels in the area vary between 37 and 39 dBA, [i.e. 32 dBA + 5 dBA tonal penalty to 34 dBA + 5 dBA tonal penalty], which is effectively a 10 dB increase over the usual nighttime levels that area residents have been conditioned to prior to March of 2006).

The second subset of transformer complaints run as follows:

The complainants state, and consultants retained by CHD, as well as observations made by GDO Staff, confirm that there is a strong tonal component to the noise emissions from the operation of the step up transformers, (an audible tone at 300 Hz, and another one at 360 Hz that run between 35 dB and 40 dB), which the complainants have identified as being particularly annoying and is probably the primary causative agent for the sleep deprivation that the three closest families are complaining of.

In both of the cases above, (or for that matter both of the above in combination), the noise emissions from the step up transformers are in compliance with NPC-232. The weighting against tones that occur below 500 Hz by the A scale system cancels out the audible tones occurring at 300 Hz and 360 Hz when viewed in conjunction with the remainder of the noise emissions from the transformer. As such the noise emissions from the transformers are in compliance with the CofA(Air) for the transformers, (40 dBA), and as MOE policy is to evaluate material discomfort/loss of use of property issues against the standards in NPC-232 and NPC-205, (in this case this is a Class 3 area as per NPC-232), and as there is no exceedance of the standards set out in those documents, there is considered to be no EPA S. 14(1) contraventions.

Understandably the complainants in this particular circumstance are not particularly receptive to our comments that the noise emissions from the transformer station are in compliance with the CofA(Air) requirements, and that MOE has no grounds to proceed with any abatement/enforcement action. Two of the three closest complainants to the transformer substation have moved out of their homes, (along with their families), and one of those families also have bought civil action against Canadian Hydro Developers, (for nuisance).

## Wind Turbine Issues

The second set of complaints relate to the operation of the 133 Canadian Hydro Developers wind turbines located in the Townships of Amaranth and Melancthon in Dufferin County. The 1.5 MW turbines, (total nameplate capacity of 199.5 MW), are spread out over an area of something like 180 km<sup>2</sup>. These complaints can be divided into three main types.

The first subset of wind turbine complaints run as follows:

Complainants state, and consultants retained by CHD, as well as observations made by GDO Staff have confirmed, that some of the wind turbines, when operating, are generating an audible low frequency tonal hum that is generally inaudible outside of structures, but is audible, again under certain conditions, inside the structures, (such as homes). Work done by the consultants has documented that certain of the wind turbines, (apparently all of those built in the second phase of construction), (88 turbines), emit an audible tone, (a 35 dB "hum" at the complainants residence when measured utilizing the NPC-103 methodology), at 160 Hz. The "hum" is indeed generally inaudible outside of homes etc. but is audible inside homes etc. and is quite annoying to the occupants. It appears that the audibility inside the homes is dependent on the proximity of the turbine(s) to the homes, as well as the susceptibility of the home(s) to sympathetic vibration due to the low frequency "hum". The complainants have identified the "hum" as being particularly annoying and is probably the primary causative agent for the sleep deprivation that the most vocal family was complaining of.

CHD has indicated that they have identified the source of the 160 Hz "hum" as being in the gear train of the turbines. CHD has also indicated that they have devised a remedy for this issue, however the remedy for this problem has yet to be demonstrated as effective.

The second subset of wind turbine complaints run as follows:

The complainants state, and observations made by GDO Staff confirm that, at some locations that the cumulative noise emissions from the operation of a number of wind turbines, (blade whoosh), are exceeding the requirements set out in the CofA(Air), (in this case the CofA(Air) references the limits set in the "Interpretation For Applying MOE NPC Technical Publications To Wind Turbine Generators"). In the cases where GDO Staff have identified exceedances of the CofA, (noise levels measured between 44 dBA and 45 dBA utilizing NPC-103 methodology with wind speeds of less than 6 m/s), there are between 37 and 52 wind turbines observable inside of a 3 km radius from the points of measurement.

The third subset of wind turbine complains run as follows:

The complainants state, and GDO Staff have confirmed, that the noise emissions from the multiple wind turbines, (primarily at night), are considerably above the normal nighttime ambient noise levels previously encountered in that area. GDO Staff measurements utilizing the NPC-103 methodology, confirm that when the turbines are not operating, the normal nighttime background ambient noise level varies between 27 and 29 dBA. When the step up turbines are operating, (excluding locations identified in the last subset), the noise levels in the area vary between 35 dBA and 37 dBA, which is effectively an 8 to 10 dB increase over the usual nighttime levels that they had been conditioned to prior to March of 2006\October 2008.

In the first and third cases above, (or for that matter both of the above in combination), the noise emissions, (measured utilizing NPC-103 methodology), from the operation of the wind turbines appear to be in compliance with the document **Interpretation For Applying MOE NPC Technical Publications To Wind Turbine Generators**. The weighting against tones that occur below 500 Hz by the A scale system cancels out the audible tones occurring at 160 Hz when viewed in conjunction with the remainder of the noise emissions from the wind turbines. As such in these cases the noise emissions from the wind turbines are in compliance with the CofA(Air) for the wind turbines, and as MOE policy is to evaluate material discomfort\loss of use of property issues against the standards in NPC-232 and NPC-205, (as interpreted by the **Interpretation For Applying MOE NPC Technical Publications To Wind Turbine Generators** document\Noise Guidelines For Wind Farms), and as there is no exceedance of the standards set out in those documents there is considered to be no EPA S. 14(1) contraventions.

Understandably the complainants in this particular circumstance are again not particularly receptive to our comments that the noise emissions from the wind turbines are in compliance with the CofA(Air) requirements, and that MOE has no grounds to proceed with any abatement\enforcement action. In this case two of the complainants have moved out of their homes, (along with their families), and have made financial settlements with CHD, with CHD buying the homes\properties from the complainants.

In the case of the second set of complaints, (measured exceedance of the CofA(Air) standards utilizing NPC-103 methodology), GDO staff have been informed by EAAB Staff, yourself among them, that NPC-103 methodology is

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not applicable to measuring noise emissions from multiple sources, (such as 37 wind turbines located inside a 3 km radius).

In all of the three cases above, District Office Staff are unable to confirm compliance, or identify non-compliance, utilizing the NPC-103 measurement methodology, with the applicable standard, and subsequently take appropriate action. EAAB has knowingly issued a series of Certificates of Approval (Air) that are unenforceable.

**Objective**

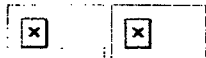
In the short term, in terms of addressing at least the three wind turbine issues noted above, the most immediate objective of the GDO is to obtain a methodology by which multiple noise sources impacting a sensitive receptor can be measured to identify compliance or the lack thereof with the applicable standard\limit. In other words, Field Staff need an addendum to NPC-103, (or for that matter a new NPC), that sets out a methodology to measure noise emissions form multiple sources impacting on a sensitive receptor. This is essential not only for these "non-GEA" wind energy approvals, and also for identifying compliance with future GEA wind energy approvals.

In the long term, in terms of addressing the two transformer complaints, and the first wind turbine issue, the objective are to:

- (1) Address the circumstances where a new noise source has been placed into a very quiet location beyond the circumstances identified and contemplated by the NPC-232 Class 3 area, and:
- (2) Address the circumstances whereby audible annoying\disruptive low frequency and near low frequency tones are present in the noise emissions from wind turbines and/or transformers, but are weighted against by the configuration of the A scale.

Feel free to give me a call directly if you require any clarification of these issues.

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**From:** Glassco, Jane (ENE)  
**Sent:** June 26, 2009 4:50 PM  
**To:** Tomlinson, Gary (ENE)  
**Cc:** Bardswick, Bill (ENE)  
**Subject:** Fw: Multiple Wind Turbine noise level measurement

Gary could you please email an update to Victor on Monday am. Thanks Jane  
Jane (blackberry)

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**From:** Low, Victor (ENE)  
**To:** Glassco, Jane (ENE)  
**Sent:** Fri Jun 26 16:43:24 2009  
**Subject:** Multiple Wind Turbine noise level measurement  
Jane,

As per my voice message today, we continue to work on developing a short term approach on how to inspect wind farms. This will be challenging, given the state of current science as outlined in Gary's email.

In order to help you out, I would like to better understand the precise issue which you are facing. Also, in terms of addressing the issue, what would your objective be?

Please also note that Doris has a meeting with Canadian Hydro Developers on Tuesday and would like to have an update on the latest issues with regard to CHD's project in your area, prior to Tuesday June 30.

Thanks,  
Victor

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**From:** Glassco, Jane (ENE)  
**Sent:** June 12, 2009 1:38 PM  
**To:** Greason, Ian (ENE); Low, Victor (ENE); Tomlinson, Gary (ENE)  
**Subject:** Fw: Multiple Wind Turbine noise level measurement

Any word on a teleconference to discuss the turbine noise issue? (See below).....Jane Glassco

Jane (blackberry)

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**From:** Tomlinson, Gary (ENE)  
**To:** Glassco, Jane (ENE)  
**Sent:** Fri Jun 12 11:13:09 2009  
**Subject:** Multiple Wind Turbine noise level measurement  
Jane:

This is further to our telephone conversation this morning:

The issue around the measurement and interpretation of obtained measurement(s) from multiple wind turbine noise sources seems to have become fairly confused, (apparently depending on how many times the issue has been retold and to whom). In short the issue is not one of is there a standard that is to be met? (To which the answerer is yes.) The issue is however does MOE have a methodology for obtaining noise measurements from multiple wind turbine sources such that MOE field, (Abatement), staff can determine spot compliance, (or lack thereof), via noise level measurement in the field? (To which the answer appears to be No.)

A quick explanation follows:

The current noise levels, (on the A Scale), that the wind turbines are required to meet, (typically as a requirement on their Certificate of Approval Air), are currently concisely identified in the October 2008 document titled "**Noise Guidelines for Wind Farms**", which superseded an earlier, (July 2004), document titled "**Interpretation For Applying NPC Technical Publications To Wind Turbine Generators**", (see attached), (PIBS # 4709e).

The problem arises in that the document, (NPC-103), (see above), that identifies the methodology by which the various measurement procedures to be used in connection with the various MOE NPC documents and other associated documents, (such as "**Noise Guidelines for Wind Farms**", and "**Interpretation For Applying NPC Technical Publications To Wind Turbine Generators**"), does not contain a methodology for the measurement of multiple dispersed sources, (such as 37 wind turbines inside a 3 km radius of a point of reception). This has been

confirmed to myself by John Kowalewski of EAAB, and apparently by Victor Low, also of EAAB to you. Also, (confirmed by Kowalewski and Low at different times), there is no alternate document identifying methodology for measurements of this type, and the development of a methodology is not ongoing or even apparently under consideration at this time.

In short, MOE field staff have no approved methodology to determine compliance with the noise levels identified in the Guideline(s)\Certificates of Approval Air for noise emissions from dispersed multiple wind turbine sources, (or any other dispersed multiple noise sources).

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