

28 January 2016

EPA Far West Operations
Attention: Michelle Gibson
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RE: BODANGORA WIND FARM – MP10_0157 – MOD 1

I am a retiree living at Wellington. I started general noise testing in 1969, working for 41 years in a testing laboratory called Testing & Certification Australia (“TCA”), which was a division of Energy Australia based in Sydney. Most of the latter part of that time I was an authorised National Association of Testing Authorities (“NATA”) Signatory in Transformer and/or Community Noise Assessment.

When I was evaluating complaints against Energy Australia, I was obliged to err on the side of the worst case scenario using maximum penalties. Energy Australia was happy with that, as they wanted to modernise the reliability of their network and improve the quality of life by working with various committees together with Noise Pollution Control Board (today's EPA) progressively amending and/or introducing new Specifications and Australian Standards as technology advanced.

Energy Australia had no wind turbines and TCA was not involved in infrasound research. We knew that using dB(A) scaled instruments was not fair, as it mismatched the frequency and amplitude dosage responses. Fortunately a New Zealand company has recently developed an infrasound dosimeter. A few weeks ago they were performing successful demonstrations and far reaching experiments at Lithgow. Was EPA Far West involved?

My measurements were occasionally cross checked by EPA field officers, who came to find out which of the available half a dozen 5dB(A) noise penalties were applicable, with maximum penalty of 10dB(A). In addition to the regular low frequency transformer noise penalty, they were specifically concerned in the intermittent off-peak hot water heating system load control motor/generator sets providing control signals at 750Hz and/or 1050Hz super imposed to the customer's mains. These motor/generator sets were normally located in separate buildings inside substation yards. They produced loud wide band airborne noises as well as harmonics noises induced into the substation transformers.

Because transformer noise was Energy Australia's main concern, we developed a time averaging technique by tape recording a mains sampling signal for the playback data processing, which facilitated detecting narrow band transformer noises better than the one third octave band system of EPA under poor signal to background noise ratios. I often helped EPA with their transformer noise enquiries.

I have only positive and constructive memories working with the EPA officers. The reason that they attended actual sites with me was that, after they had given me copies of all their noise compliance requirements, definitions and field working manuals, they wanted to witness my testing procedures and keep me “honest” by comparing the results using their own instruments on the same windless and cloudless nights under the same temperature inversion conditions. These inversions were determined by the duty forecaster of the Bureau of Meteorology and for most metropolitan suburbs overnight between 10pm and 6am were often in the range of 5dB(A) to 10dB(A). To my knowledge this service has been discontinued.

I have noise tested just about all Energy Australia’s zone substations up to year 2010 and hundreds of kiosk substations and all types of pole transformers. Just to drop some names, I was head hunted to noise test the transformers that went to Sydney Opera House, the Snowy Mountain Scheme and Sydney Olympic Stadium. I have also solved at least 100 noise complaints to customer’s satisfaction.

During the olden days with only basic instrumentation the hardest part of the noise work at night was to get the right background value into which all the various character adjusted measured values were compared and exceedances determined. There was a time when the EPA insisted that the A-weighted L95 was used and if the measured values were less than the traffic related reference lookup table ‘R-values’, the lowest measured values were to be used for the background.

Today’s ‘deemed’ minimum allowable background of 30dB(A) makes a mockery of the quality of life in quiet rural backgrounds where L90 values using modern instruments are typically from 18dB(A) to 25dB(A).

For example, some residents 5 km away from the Uranquinty gas fired power station, which is improperly located on the edge of the town, come to town to get noise annoyance relief. The actual offending noise is louder in the town than at their home, but because the town’s background is also substantially higher, the lower excess over the town’s background gives them some relief from subjectively higher annoyance at home, where the farmer ‘hears’ only the excess over his own true quiet background not the excess over the deemed guidelines. The ‘worse’ situation in town ‘feels’ better to him.

In Australia, when there would be several individual 5dB(A) penalties, wind farms have been given a grace of maximum penalty of a single 5dB(A) only. To my knowledge wind farms have never been penalised in Australia. Even the noise policy says that, if the proponent cannot prove that the ‘amplitude modulation’ (which term the proponent wants to use without admitting tonality penalty) at the blade passing frequency is not less than 4dB(A), a penalty of 5dB(A) must be added to the predicted or measured noise levels.

It is my understanding that Infigen Energy (“Infigen”) has not yet applied for an Environment Protection Licence (“EPL”) for the Bodangora Wind Farm so you have not been able to start your technical evaluation for the above project.

Background

Wind power is not squeaky clean “sustainable” free energy. Wherever it has been introduced to the public, total cost of electrical energy has gone up. Wind farms around the world survive temporarily only in the current political climate due to enormous government subsidies.

Some of the “puppet masters” who control the electricity grid even allow Wind Farms to pay them to supply the power during windy conditions when there is excess supply, thereby creating massive problems for other baseload suppliers. During the calm periods Wind Farms are unable to meet demand. Consequently, the baseload providing system must be kept up to date and technologically efficient and capable of supplying 100% of the power, making Wind Farms a superfluous cost burden. The grid is not a warehouse of electrical power, which parasitic wind turbines can top-up with random bursts of poorly frequency controlled energy with harmonic distortion, which utility companies do not want.

There are various adverse effects. It has been reported that in Europe alone at the end of 2015, there are 890 organisations registered under the European Platform Against Windfarms (“EPAW”) trying to expose them. The wind industry is still in its infancy and the future deserted graveyards of ‘triangular lightning masts’ are not yet visible in bulk.

In Denmark, the home of Vestas, the average age of Vestas turbines which have been terminated is 17 years. There has not yet been enough time for large scale comprehensive adverse long term controlled clinical studies. Proponents get away by claiming that failure of adverse non-evidence is evidence of non-failure.

Infigen’s original poorly drafted project application for Bodangora Wind Farm was only generic. The noise predictions were made using reverse engineering. By knowing what the end receiver compliance values are, the noise source values are predicted to be low to meet these requirements regardless of what the actual measured values from other Infigen Wind Farm sites are after construction.

The nearby Bodangora community is polarised between non-associated and associated farmers, who are not talking to each other. Non-associated farmers are worried about adverse effects and reduced land values, while the associated landowners are laughing all the way to the bank, after selling their souls, as the long term adverse effects have not started to cumulate yet.

MP 10_0157, the Bodangora Wind Farm Project, has been on foot since 2010 and was approved by the Planning Assessment Commission on 30 August 2013 under controversial circumstances. It was subsequently modified in October 2015 after an inadequate application was accepted by the Department of Planning. I did not become involved in evaluating the noise data until a long time after the Modifications were issued.

Here are some generic steps Infigen may have used at Wellington:

1. The proponent approached the local council offering a Community Benefit Scheme for various local charities, clubs and sporting clubs. A Voluntary Planning Agreement was entered into that contained further promises of road maintenance as well as promises of hundreds of local jobs during the construction phase and generous compensation to associated landowners.
2. The proponent sent a vague project application to the NSW Department of Planning and Infrastructure (“the Department”)
3. There was no need for rigorous assessment by the Department as the wind farm projects are heavily desired and subsidised by the Government and the Proponent is happy to assemble and the Council is happy to receive whatever turns up from various manufactures.
4. Conditional approval is granted by the Planning Assessment Commission (“PAC”) despite strong opposition from nearby landowners, the Wellington Correctional Centre and Wellington businesses and residents.
5. A Community Consultative Committee is formed but in reality it is not representative of the Wellington community. It is nothing more than another vehicle to mask the dangers of the Wind Farm at this location
6. As the Wind Farm could not be made noise compliant for the nearest residences, they are shut up and bought out to become associated proponents. They lease their land to Infigen and receive a substantial lease payment per year for the life of the Project. What happens after that is unclear.
7. More and more complaints of lack of information are coming in and the proponent modifies the application slightly for the local conditions. The Department accepts the modifications trusting that the proponent automatically makes everything compliant.
8. Noise predictions are made utilising an A-weighting filter that is not capable of responding to inaudible low frequency noises nor infra sound. These outdoor signals can make the windows rattle several kilometres away from the turbines. The sensations are felt worse indoors where masking effect of the background noise is reduced and the residents may not hear the turbines from rattling teacups. At night the offending noise may cause long term sleep disturbances, which can build up especially in lying down position.
9. Instrument, measuring and turbine uncertainties in dB(A) terms are not disclosed and added to measurements or predictions.
10. The worst case temperature inversions in dB(A) terms are not disclosed and added to the predictions.
11. Proponent dismisses all possible adverse effects to people and animals.

As recently as on 20 January 2016 in the Wellington Times article headlined “Public encouraged to consult Infigen” they introduced *“The most recent study that was released by Health Canada in November 2014. This comprehensive study involved 1238 homes....”* Infigen’s conclusion was: *“This study found no linkage between wind turbine noise exposure and health impacts.”* despite the original Health Canada study stating: *“Statistically significant exposure – response relationship were found between increasing Wind Turbine Noise levels and the prevalence of reporting high annoyance. These associations were found with annoyance due to noise, vibrations, blinking lights, shadow and visual impacts from Wind Turbines. In all cases, annoyance increased with increasing exposure to WTN levels.”*

12. Proponent promotes the project by inviting local trade’s people to workshops and declares the likely construction starting date despite formally asking the Council not to support the Project.

13. Eventually the proponent will put pressure on EPA, which is expected simply to grant the Environment Protection Licence as the project has been on foot already for several years and the proponent is keen to start construction.

The purpose of this letter is to bring to your attention that I and EPA put in a lot of effort by helping each other in the past against evasive proponents. I wish to continue to assist EPA along those lines with regard to Infigen Energy and the unanswered questions about the proposed Bodangora Wind Farm. The lack of meaningful noise data is not acceptable.

TURBINE NOISE

Infigen declared that the sound power level for VESTAS and/or GE Turbines is 106dB(A) and the distance between Turbine 16 and Residence R13 is 2410m. Mathematically noise from a single source decays over 2410m approximately 79dB(A) leaving 27dB(A) for Resident R13. When the noise of a single turbine at Resident R13 is 27dB(A) the complete wind farm noise including contributions from all 33 turbines at Resident R13 cannot be disclosed as 31dB(A), it must be substantially louder, as already the closest 2 turbines would make it 30dB(A).

It is difficult to predict wind turbine noises. There are about 10 computer systems trying to do that. Their methods and predictions scatter substantially even up to 10dB(A). The accuracy of internationally used ISO 9613-2 method is generally accepted to be +/-3dB(A).

VESTAS is currently advertising that their V112–3MW wind turbine with hub height of 84m and rotor diameter of 112m with wind speed of 8m/s has sound power level of 107.5dB(A). Infigen preferred 120m or 130m blade diameter version could be louder than the above 107.5dB(A). Including 3dB(A) uncertainty, it could be at least 110dB(A) which I have used in my home made assumptions using ‘decay with distance method’.

I believe that some of the turbines may be located too close to each other creating turbulence, which in turn may cause unsteady blade loadings increasing sound levels. Also when the modified longer blades pass the tower it may generate greater air pressure pulses, which could be felt further away.

There is not enough technical information to assess the effect of the proposed lower towers and longer blades in MOD 1. There is however published scientific studies that show that larger blades generate more infrasound and low frequency noise over a much greater distance. See *Moller & Pedersen Low-frequency-noise-from-large-wind-turbines-(2010)*. <http://waubrafoundation.org.au/resources/moller-pedesen-low-frequency-noise-from-large-wind-turbines/>.

Infigen has not provided enough frequency data, so penalties due to tonality and amplitude modulations could not be evaluated. The proponents seem to use long term averaging method where the fluctuations may fill the gaps between adjacent one-third-octave bands appearing to make the method smooth and compliant, when in fact the residents will be subjected to peaks of sound energy pulses in the infrasound and low frequency noise ranges, which have been known for thirty years to directly cause sleep disturbance and what are known as “annoyance” symptoms.

Infigen should have produced evidence prior to MOD 1 being Publicly Exhibited that their currently operating turbines do not become noisier with time and do not exceed the predicted noise levels. The measured total sound power level of the turbines at Capital 2 and Macarthur wind power development in Victoria (which used V112 VESTAS-3MW wind turbines) should be made available, as well as the predicted values. Infigen and turbine manufacture VESTAS should prove what they have promised and that their predictions can be trusted using real measurements post construction. Infigen has not released any post construction data. In Canada measured post construction values exceeded the predictions by 5dB(A) to 7dB(A) in similar size projects.

When Health Canada compared various groupings of 8 to 12 turbines where industry sourced estimates of yearly averages were used in place of actual daily in-home noise measurements, the measured sound pressure levels were up to 15dB(A) above the estimated levels.

My expertise is in substation noise testing. There is not enough meaningful data for me to properly evaluate these turbine noises. However, using basic acoustic principles I have compiled the following table without any penalties using “for information only” principles indicating values that some non-associated landowners might be exposed to.

BODANGORA WIND FARM PREDICTED NOISES AT THREE NON ASSOCIATED RESIDENCES

TURBINE NUMBER	EACH TURBINE DISTANCE FROM RESIDENCE m			EACH TURBINE NOISE CONTRIBUTION TO RESIDENCE dB(A)		
	R11	R12	R13	R11	R12	R13
10	5939	8755	6310	23.1	19.8	22.6
12	9214	3152	3505	19.3	28.6	27.7
13	9563	2714	4206	19	30	26.1
15	5982	3677	4995	23.1	27.3	24.7
16	8952	4246	2410	19.6	26	31
17	10567	3458	4207	18.1	27.8	26.1
18	10829	4159	3549	18	26.2	27.6
19	10611	3765	3769	18.1	27.1	27.1
20	7860	3633	3330	20.7	27.3	28.1
21	7292	3502	3856	21.3	27.7	26.9
22	7729	4071	3155	20.9	26.4	28.6
23	8035	4684	2541	20.4	25.2	30.6
24	6943	4903	3505	21.8	24.7	27.7
25	5022	3590	6485	24.6	27.5	22.4
26	5327	3765	5784	24.5	27.1	23.4
27	5153	3677	6047	24.4	27.3	22.9
29	5153	4596	5433	24.4	25.4	23.9
30	6375	6172	4119	22.5	22.8	26.3
31	4847	4728	5828	24.9	25.1	23.3
32	3319	5165	7712	28.2	24.4	20.8
33	3800	5165	6836	27	24.4	21.9
34	6332	6566	4294	22.6	22.3	26
35	6550	6435	4294	22.3	22.4	26
36	3537	5778	6836	27.6	23.4	21.9
37	5939	7135	4908	23.1	21.5	24.8
38	2402	6041	8500	31	22.9	20
39	2925	6654	7449	29.2	22.2	21.1
41	2096	6916	8325	32.2	21.8	20.2
42	4410	8230	7010	25.7	20.3	21.6
43	7118	9805	6485	21.5	18.3	22.4
44	5370	9674	7712	24	18.9	20.9
45	4980	9500	7887	24.8	19	20.7
46	3886	9455	8588	26.8	19.1	20
Total Predicted Noise from all Turbines				40.3	40.5	40.8
Maximum Allowable Noise Level				35	35	35
Excess over Maximum Allowable Noise Level *				5.3	5.5	5.8

* EPA will not normally grant Operating Licence if the excess is greater than 5dB(A).

SUBSTATION NOISE

I urge you not to bundle the substation noise together with the wind farm turbine noise. In my opinion, under calm conditions, the substation must be treated as an individual offending noise source.

I am dissatisfied that *“the Department is satisfied, based on the Proponent’s assessment and predicted low levels of noise generation that the Project substation would not pose an operational noise risk to surrounding receptors by itself or cumulatively with associated wind turbines.”* (Reference: p19 Director General’s Environmental Assessment Report)

There is no disclosed transformer noise data, nor predicted temperature inversion information for the proposed substation. To say simply that the substation noise at the nearest resident is 26dB(A) without any evaluation details is not satisfactory.

In my view it is reasonable to presume that the transformer to be installed at Bodangora is similar to Infigen’s already commissioned transformer at Capital Wind Farm near Bungendore that emits 104 dB(A), particularly at the harmonic frequencies at 100 Hz intervals, requiring unavoidable tonal penalty of 5dB(A).

Residence R17 is approximately only 1300m from the substation. Mathematically transformer noise decays over 1.3 km by 73dB(A) thereby remaining at level of 31 + penalty of 5 =36dB(A) at Residence R17.

The Wind Farm maximum allowable noise limit of 35dB(A) does not apply here. The substation must be assessed on its own. When the background level LA90 is determined correctly, it is likely to be less than 25dB(A). The proponent will argue that when the background is less than 30dB(A) it is deemed to be 30dB(A).

What makes the substation noise intolerable is that on perfectly calm clear nights when the turbines are stationary, (in other words the Wind Farm does not exist) the transformer is still energised. Its noise in the warm air some meters above ground travels faster than in the cold air near the ground bending the noise down accumulating several decibels louder to residents at R17 due to temperature inversion. Temperature inversion of at least 5dB(A) is very common, so it has been used here.

Resident R17 will hear the transformer noise of 31dB(A), but because it is composed from pure harmonics tones at 100 Hz intervals and due to its character it is more annoying, so a penalty of 5dB(A) must be added, but it is not enough, as temperature inversion adjustment of 5dB(A) makes the substation appear to be closer and louder making the adjusted substation noise sound like it was 41dB(A) exceeding the “true” rural background of less than 25dB(A) at least by 16dB(A). The deemed background of 30dB(A) will also be exceeded by 11dB(A). How on earth can the NSW Department of Planning be satisfied with these massive exceedances and ignore this substantial non-compliance.

To make the situation worse, based on my lifetime transformer testing background, all transformers became noisier, as they age and/or are transported. Clamping of the iron core laminations become looser, due to transportation as well as with heating and cooling cycles. This perishes the insulation between core laminations, making wider gaps, requiring higher magnetic flux densities, which can be compensated by using higher taps. Typical substation transformer has 8 winding taps for voltage control.

Each tap increases transformer voltage typically by 5%, which in turn increases transformer noise by approximately 3dB(A). It is assumed that the above transformer noise of 104dB(A) was measured at rated voltage. Higher load can easily force the tap-changer go up by 3 taps making the transformer 9dB(A) noisier. In addition, depending on the tap-changer type, between resistive and/or reactive and its odd and/or even tap numbers can increase the transformer noise substantially. Transformer cooling fans and/or pumps themselves contribute additional noise. Temperature is also a factor. Hot transformers are noisier than cold ones. I will challenge the proponents claim that the predicted substation noise at resident R17 is only 26dB(A).

I was involved in this “noise game” all my working life. With this too long letter I would like to help you as I understand why EPA has unfair poor image.

Industry complains that EPA suffocates them with too tight noise rules. Public complains that EPA does nothing to stop noise until it is too late, without knowing that EPA cannot act before the operating license is applied for. What makes it worse for the EPA is that the not submitted Infigen application is likely to be based on evasive under estimated low data, which on its face value is easily acceptable.

Suddenly we have built a future embarrassment. The politicians who approved the subsidies have left. Without subsidies the proponent has disappeared. The only thing that is left is a graveyard and a question – why was that approved?

I believe that had the “true exceedances” been declared in the first place, the application at this site would and should have been rejected outright by the EPA, the Department and the PAC.

I would urge you to not to issue an EPL due to lack of sufficient meaningful data as the Project appears to be non-compliant at this site and the substation, on its own is non-compliant at this site.

Yours sincerely,

Martin Sannikka
Retired NATA accredited Noise Signatory