**ROYAL ENVIRONMENTAL HEALTH**

**INSTITUTE OF SCOTLAND**

# Scheme of Continuing Professional Development

## Written submission in support of Chartered EHO requirements

**Douglas Caldwell**
**Environmental Health Officer**
**Moray Council**

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# Reflections on the experience of giving evidence at a joint Public Planning Enquiry on Clashgour and Rothes 3 wind farms at the Macdonald Highland resort, Aviemore, 9th September 2020

## Introduction

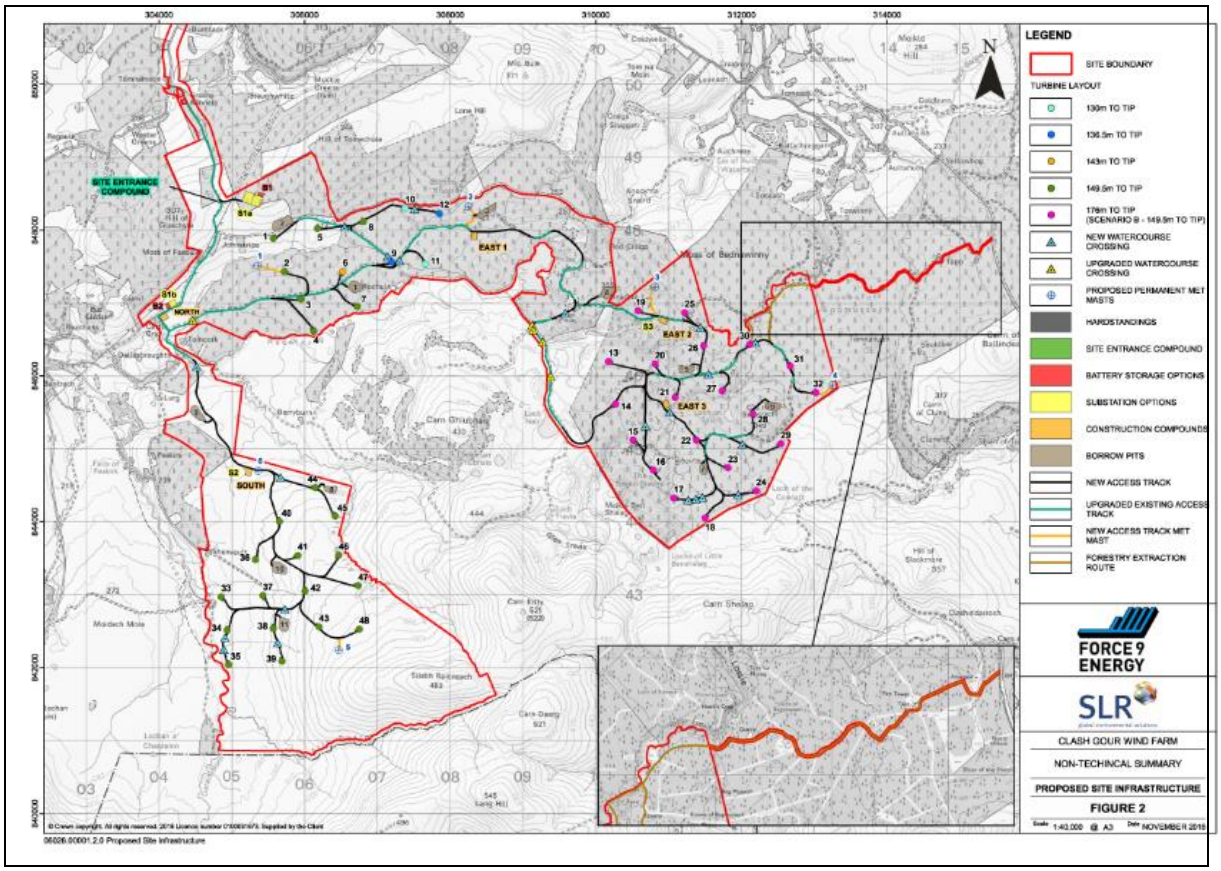
In what has been a dramatic year for all of us I thought it might be worth sharing some personal experience of a joint wind farm inquiry, and in particular the conditions hearing session I took part in for the proposed Clashgour and Rothes 3 wind farms in Moray. The challenges of giving oral evidence crossing from different wind farm with different conditions in the same time slot is I feel useful to report to fellow members. I understand this was the first inquiry in this format and was being promoted by the Scottish Government as a positive economic benefit. I hope to give some insight into the time that was required in advance of the Inquiry session and the inevitable last minute machinations between lawyers representing the Council's position and two sets of lawyers each with different nuances on their own position on their development. I think it will also be useful to reflect on how preparation was impacted by the demands of the Service on the imminent Public Health demands associated with the Covid pandemic. I will highlight challenged conditions promoted by the Council and comment on the alternatives proposed by the other developments. Of special interest to fellow noise practitioners is the promotion of the amplitude modulation condition from the IOA Acoustics Bulletin[1] as opposed to the differing positions taken by each development. In addition to this it is worth commenting on the discussions in relation to Moray Council's promotion of commissioning noise monitoring with proactive monitoring thereafter, as opposed to the differing views presented by the developer's representatives.

## Consultation phase and build up to the Inquiry

For colleagues unfamiliar with the process here is a brief outline of the Planning consultation activities. The Environmental Health Section gets consulted on an application and has to form a view on whether to object, recommend conditions, provide Informatives (Information to the applicant on EH legislative requirements) or make no comments. The pertinent issues in relation to wind farm are environmental impacts associated with the construction and operational phase. Typical considerations at the construction phase are associated noise from the construction of roads, including blasting to form borrow pits for road construction. Potential disruption to private water supplies also needs to be considered. In relation to the operational phase it is the noise associated with the wind turbines, as well as potential shadow flicker aspects. In addition the possibility of cumulative noise impacts from existing wind farms consented or built is becoming an increasingly complex

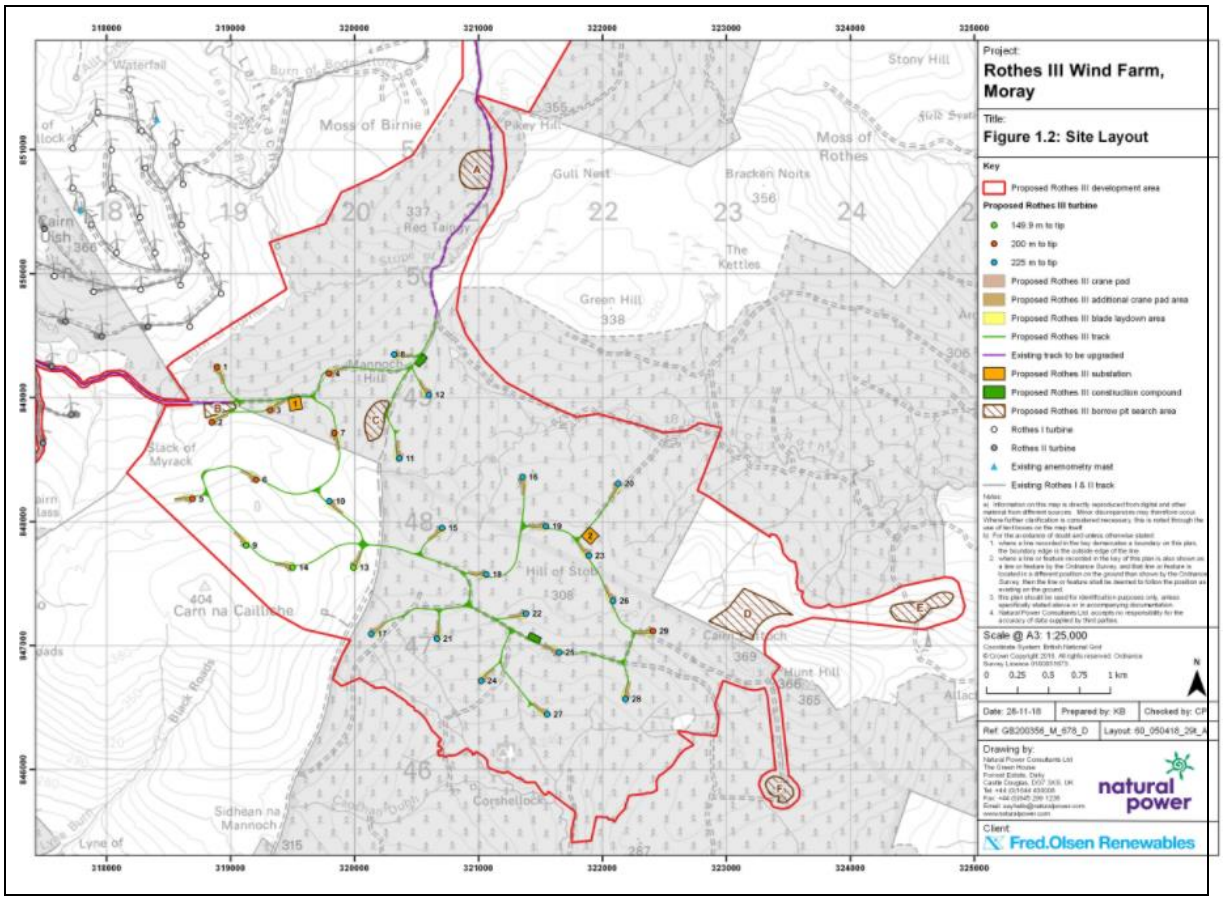
consideration. Both developments were of a power output above the 50 MW threshold for consideration at the Local Authority level, and instead the final decision on the application would be determined by Scottish Ministers. In both cases the Council had objections on the grounds of visual impact and as a significant consultee in the process, this objection precipitated a Planning Inquiry to be held in Aviemore.

In terms of the timeline on these applications, Rothes 3 appeared to the Council for consultation in 12th, and Clash Gour in 17th December 2018. It is of significance the length of time that an application finally reaches its consideration phase at inquiry from the initial consultation. The detail and depth that is required to work well on these projects gets affected as time goes on and there's no ongoing input. These two developments then headed for Inquiry in what was the most challenging year for all EH Services as the priority shifted to the Service having to respond and adapt to Covid 19.A map showing the layout for Clash Gour is shown here:




**Clash Gour features**- as can be noted from the above plan, this is an extensive application covering three 3 geographical regions and a variety of infrastructure to support the 48 wind turbines. In particular blasting of borrow pits and the use of crushers/screeners needed evaluation, as well as the formation of battery storage and sub-stations (assessed with respect to BS 4142). Furthermore, the proposal was looking at an alternative "Scenario B" to be factored in with substation locations to be in optional locations and for certain turbine to be at a lower or higher tip height. Added

to that was an amendment to some turbine positions to mitigate against peat loss that lead to the re-evaluation of the noise model, submitted as an Additional Information (AI) document. I did meet with Hoare Lea's appointed noise consultant Matthew Cand on the initial background noise installations, as recommended by the Institute of Acoustics Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise [2], and this assisted in appreciating the scale of the project.
A plan layout showing the features of Rothes 3 is detailed below -




**Rothes 3 features** – this development had some similar features to Clash Gour and was also being submitted as an alternative layout, again supported by an AI document. Our appointed independent noise consultant Mr Dick Bowdler carried out his own site assessment to aid in the evaluation. On this occasion no background noise monitoring was necessary as predicted noise levels were well below the threshold of L A 90 35 dB.

In both the projects detailed submissions were included in Environmental Impact Assessments covering the above requirements. The Section was fortunate to attain the services of an independent noise consultant in the consideration of the Rothes 3 project, who assisted in validating the model inputs of the developer's consultant, and also provided advice on recommended conditions for operational noise. The collaborative working with our appointed consultant proved of considerable assistance

in aiding understanding of the development's areas of complexity. Through agreement and discussion the promotion of amplitude modulation (AM) throughout the IOA Good Practice Guide[2] (GPG) style condition was made in our consultation response. This is what is commonly referred to as the IOA Technical Bulletin Article from Acoustics Bulletin of November/December 2017 [1]. A further brief discussion on this condition and its origin is worthwhile here -

**Amplitude modulation (AM)** – the development of a planning condition for amplitude modulation has been possible through a series of collaborative studies on the subject. This culminated in the IOA Amplitude Modulation Working Group (AMWG) in their 9 August 2016 titled "*Final report. A Method for Rating Amplitude Modulation in Wind Turbine Noise*" [3]. They define AM it as:
"periodic *fluctuations in the level of audible noise from a wind turbine (or wind turbines), the frequency of the fluctuations being related to the blade passing frequency of the turbine rotor(s)"*
This report highlights that the subject has been one of growing concern to the public and recognised the need "to define a robust procedure for measuring and assessing AM, to provide a consistent means of evaluating complaints and to form the basis of appropriate planning conditions that might be applied to regulate AM from new wind turbine development".

Running concurrently to the IOA AM Working Group was the Department of Energy and Climate Change (DECC) Wind Turbine AM Review [4], issued in August 2016, the Phase 2 Report makes the Conclusions and Recommendation:

"*Conclusions*

*The review has concluded that there is sufficient robust evidence that excessive AM leads to increased annoyance from wind turbine noise, and that it should be controlled using suitable planning conditions*.

*Recommendation*

*It is recommended that excessive AM is controlled through a suitably worded planning condition which will control it during periods of complaint. Those periods should be identified by measurement using the metric proposed by work undertaken by the Institute of Acoustics [1], and enforcement action judged by Local Authority Environmental Health Officers based on the duration and frequency of occurrence."*

Both these documents are considered highly significant and persuasive in support of the need for a planning condition for AM.

Given the lack of certainty associated with when AM may occur and that it cannot be robustly predicted when likely, the condition also supports the precautionary principle with this issue.

There is therefore growing consensus on the need to deal with possible AM effects occurring, in spite of the current lack of understanding on how it is occurring and being able to predict if and when it occurs. From the above work came the formulation of the condition from the IOA Acoustics Bulletin of November/December 2017[1]. Throughout the lengthy consultation phase on both developments the Environmental Health Section promoted this condition for consideration at the Conditions Hearing Session to take place. Model validation and acceptance of noise limits meant that no objections were made on noise grounds, however, both applicants were not in agreement on this promotion of the IOA Acoustic Bulletin[1] condition and it was left for further discussion at the Inquiry. Both applicants sought the typical rating level condition approach without the inclusion of the amplitude modulation throughout it. These are lengthy and complex conditions are for ease of referencing are included in the appendix within this dissertation.

The alternative conditions on AM promoted by Rothes 3 noise consultant was as follows-

"*Within 21 days of a written request by the Local Planning Authority, following a complaint to it from a resident alleging noise disturbance at the dwelling at which they reside and where Excess Amplitude Modulation is considered by the Local Planning Authority to be present in the noise immissions at the complainant's property, the wind farm operator shall submit a scheme, for the approval of the local planning authority, providing for the further investigation and , as necessary, control of Excess AM. The scheme shall be based on the best available techniques and shall be implemented as approved."*

A similar scheme based approach was also suggested by Mr Marcus Trinnick QC, representing Clash Gour, and reproduced below –

"*Within 21 days of a written request by the Planning Authority, following a complaint to it from a resident alleging noise disturbance at the dwelling at which they reside and where Excess Amplitude Modulation is considered by the Planning Authority to be present in the noise immissions at the complainant's property, the wind farm operator shall submit a scheme, for the written approval of the Planning Authority, providing for the further investigation and, if determined as necessary, control of Excess Amplitude Modulation. The scheme shall be implemented as approved*"

Both these conditions might be considered suspensive conditions and triggered by a complaint that the Planning Authority consider to be related to AM at the complainant's property. Neither proposal further defines the type of scheme that would be acceptable or indeed if the IOA AM metric method[3] would be used. These differences are further explored on the Inquiry Day and Outcomes section later.

**Commissioning testing**- a further area of divergence between the Council's position and both applicants were in relation to a condition seeking the proactive measurement of wind farm noise within the first year, and thereafter at two year intervals until the Planning Authority extended or deemed it no longer required. The final wording proposed is detailed below and the differences to the applicant's positions are highlighted in green and yellow-

. ***The wind farm operator shall employ an independent consultant, approved by the Planning Authority, to measure, at the operator's own expense, the level of noise immisions from the wind turbines within the first year of the operation of the turbines, and every two years thereafter, from three locations to be approved in writing by the Planning Authority unless and until the Planning Authority extend the period or determine that continued compliance monitoring is no longer required. The measurement procedures, which may include filtering data according to wind direction, shall be agreed with the Planning Authority prior to commencement. The results of any measurement exercise shall be forwarded to the Planning Authority as soon as practicable after the completion of the monitoring exercise. Unless otherwise agreed with the Planning Authority the turbines shall be switched off during part of the monitoring period to permit reliable background noise level data to be determined at the range of wind speeds from 4 m/s to 12 m/s.***

The alternative wording proposed by the noise consultant representing Rothes 3 was as follows

*"The wind farm operator shall employ an independent consultant, approved by the Planning Authority, to measure, at the operator's own expense, the level of noise immisions from the wind turbines within the first year of the operation of the turbines, from three locations to be approved in writing by the Planning Authority. The measurement procedures, which may include filtering data according to wind direction, shall be agreed with the Planning Authority prior to commencement. The results of any measurement exercise shall be forwarded to the Planning Authority as soon as practicable after the completion of the monitoring exercise".*

The legal representative for Clash Gour Wind Farm, Mr Marcus Trinnick QC promoted the following

"*The wind farm operator shall employ an independent consultant, approved by the Planning Authority, to measure, at the operator's own expense, the level of noise immissions from the wind turbines within the first year of the operation of the turbines. The measurements shall be made in accordance with procedures which shall be approved in advance in writing by the Planning Authority. The results of the measurement exercise shall be forwarded to the Planning Authority as soon as practicable after the completion of the monitoring exercise. Unless otherwise approved in writing by the Planning Authority the turbines shall be switched off during part of the monitoring period to permit reliable background noise level data to be determined at the range of wind speeds from 4 m/s to 12 m/s. The requirements under this condition shall cease when, following a written request by the wind farm operator, the Planning Authority confirms that the requirements of condition 1 [the rating condition] are met."*

The main areas of difference relate to the Council's position of seeking a more proactive noise monitoring regime, with the flexibility to reduce the frequency of future

years testing where evidence demonstrates it. This condition promoted by the Council has been previously accepted at Edintore wind farm, Lurg Hill and Hill of Glaschyle in the Moray area, all of which were won on appeal against the Planning Authorities refusal recommendations. I was also aware of a similar condition provided in wind turbine guidance by Aberdeenshire Council[5] and South Ayrshire Council[6]. Both applicants were promoting a test within the first year with nothing else throughout the lifetime. Their argument would be that complaint led noise issues can trigger the main noise condition to investigate rather than having the cost of routine compliance monitoring with some shut down periods for assessment purposes.

Scottish Ministers may also look to their document of "specimen conditions" [7] provided to the Energy Consents Development Unit (ECDU) to assist in consideration of appropriate conditions, with the aim of assisting consistency in decision- making. This document is attached in the Appendix to this report.

In my recommendation to Planning I am mindful of a variety of key documents in the formulation of planning conditions and these include the following:

- Circular 4/1998 and accompanying Annexe[8]
- IOA Good Practice Guide To the Application of ETSU-R-97 For the Assessment and Rating of Wind Turbine Noise[2]
- Moray Council Wind Energy Guidance[9]

Decision makers will be mindful of the need to ensure the 6 tests of Planning are met in conditions, namely

- Necessary
- Relevant to Planning
- Relevant to the development to be permitted
- Enforceable
- Precise
- Reasonable in all other aspects

It is these 6 tests that were anticipated to be areas of debate at the time of the Inquiry Conditions hearing session

**Inquiry day Outcomes – 9th September MacDonald Resort, Aviemore**

In the days leading up to the Inquiry there was intense negotiation and discussion on the conditions promoted by the Council. Around 7 to 10 working days were consumed prior to the Inquiry day with requests for clarification etc. between Council's legal team and the developer's representatives. This did create the need to ask for space away from Covid work until the Inquiry date had passed and I am grateful for my colleagues assisting in the various service request, complaints, advice etc. during that period. The added pressure of having to retain a depth of understanding on two projects at the

same session was a real challenge. In particular both wind farm developers were not all agreeing and disagreeing on the same issues, however, the format of the Inquiry was to take a theme, eg AM, and discuss in one time period covering both wind farms at the same time. This was logical in terms of saving time but did add some anxiety to being able to retain the breadth of issues.

**Commissioning condition debate**-

On the day of the enquiry both applicants representatives repeated the view against the Council's commissioning condition with their joint position of it being "unreasonable" to seek further testing every two years and also onerous on the operator with the need for periods of shut down. The planning test of "necessary" was also put forward on the basis that if the initial post - commissioning test showed compliance there would be no reason to believe that would change in time.

I provided my view that further testing beyond the initial test period was a useful pro-active means of checking compliance, that it can look at trends in the noise situation in what was increasingly a complex landscape of existing turbines rather than wait for complaints to arise, and also suggested that wear and tear and noise increases over the lifetime could not be dismissed. I cited that this condition had been agreed in several previous developments and that there had been good agreement on the reduction of the two year frequency in several developments, where a good level of compliance had been observed. The condition was also endorsed as entirely reasonable by our appointed noise consultant.

The Reporter will form a view in time on this condition.

**AM condition debate-**

On the AM condition Mr Trinnick acknowledged the growing consensus of the need to control AM. The current area of risk he feels with the Council's condition is in relation to what amount of AM occurrence would trigger a 3 dB penalty to the rating level; eg one 10 minute period or several? This, he argues, appears to still be an unknown factor in the condition. Mr Trinnick also felt that this would be too "fixed" a correction given the current state of knowledge in the subject and the possibility that this curve or the way of applying penalties on AM may change in the future as knowledge increases or Government provides more guidance. Rothes 3's appointed consultant Mr Rob Shepherd was of a similar viewpoint, citing that research into AM was still evolving and at this juncture a scheme based approach ensures best practice is accounted for at the time of an investigation. I provided input to the Inquiry Reporter that this condition has been formulated and agreed by a broad consensus of noise professionals and arguably contrary to the above, does give a level of detail and precision on what method of assessment is to take place, with the clarification that best practice at the time of investigation is accounted for in Guidance Note One to my recommended condition (see Appendix) : "*the IOA Metric is 'A Method for Rating Amplitude Modulation in Wind Turbine Noise'…**or any update of that current at the time of measurement***".** In addition the condition was promoted and endorsed by our appointed noise consultant. It was also a broad recognition of public concern over time, discussed in the IOA AM Method, of the need to define a robust procedure for

measuring and assessing AM, and also to form the basis of appropriate planning conditions.

Taking a step back from the Inquiry it is recognised that the IOA GPG of 2013[1] predates the IOA AM Working Group document of August 2016 [3], and reported then "*7.2.1 The evidence in relation to 'Excess' or 'Other' Amplitude Modulation is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM"* In addition, the introduction section of the IOA Acoustic Bulletin November/December 2017- A planning condition for wind turbines[1] notes:
"*This approach is proposed based on the current state of understanding, but may be subject to modification in light of new research and further robust information*". To date the Scottish Government do not appear to have come to a defined view on how to deal with AM , perhaps awaiting further defining research.

## Outcomes and Conclusion

At the time of writing the outcome of these hearings is not yet known. Notwithstanding that, this dissertation is a personal reflective evaluation of my work and input into the process.
In particular in relation to AM, it is an easier path to just ignore the complex phenomenon as needing "further research". I would endorse the continued promotion and discussion of AM with other Environmental Health consultees.
The joint inquiry experience/format and complex subject matter did take me out of my comfort zone and that is a good aspect of personal development to be challenged. I hope the experience has assisted in attendance at further Inquiries and Planning committees in the years ahead.
In terms of collaborative working, there is much that I have learnt of value in discussions with my own planning colleagues, as well as my interactions with Council's legal advisers and appointed noise consultants representing the developers. At all times, the need for clear written and oral communication are key aspects, and the need to avoid over use of jargon and technical language needs to be considered. I am also very grateful for the input of Mr Dick Bowdler in the consultation process and this has improved my knowledge and understanding.

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**Appendix 1**

Proposed planning conditions on noise for Rothes III Wind Farm

1. The rating level of noise immissions from the combined effects of the wind turbines hereby permitted (including the application of any tonal penalty and amplitude modulation (AM) penalty), when determined in accordance with the attached Guidance Notes, shall not exceed the values for the relevant integer wind speed set out in or derived from Table 1 attached to these conditions and:

   A) Within 21 days from receipt of a written request of the Planning Authority, following a complaint to it alleging noise disturbance at a dwelling, the wind farm operator shall, at its expense, employ an independent consultant and provide a written protocol to be approved by the Planning Authority. The protocol shall describe the procedure to assess the level and character of noise immissions from the wind farm at the complainant's property in accordance with the procedures described in the attached Guidance Notes. The written request from the Planning Authority shall set out as far as possible the time or meteorological conditions to which the complaint relates and time or conditions relating to tonal noise or AM if applicable. Measurements to assess compliance with the noise limits shall be undertaken in accordance with the assessment protocol which shall be approved in writing by the Planning Authority.

   B) The wind farm operator shall provide to the Planning Authority the independent consultant's assessment of the rating level of noise immissions undertaken in accordance with the protocol within 2 months of the date of the approval of the protocol by the Local Authority unless otherwise agreed by the Planning Authority. The assessment shall include all data collected for the purposes of undertaking the compliance measurements and analysis, such data to be provided in a format to be agreed with the Planning Authority. Certificates of calibration of the equipment shall be submitted to the Planning Authority with the report.

   C) Where a further assessment of the rating level of noise immissions from the wind farm is required pursuant to Guidance Note 5 of the attached Guidance Notes, the wind farm operator shall submit a copy of the further assessment within 21 days of submission of the independent consultant's initial assessment unless otherwise agreed by the Planning Authority.

Table 1: Between either daytime (07:00 to 23:00 hours) or night time periods (23:00 to 07:00 hours) – Noise limits expressed in dB $L_{A90,10\ minute}$ as a function of the standardised wind speed (m/s) at 10 metre height as determined within the site averaged over 10 minute periods

| LOCATION | Standardised Wind Speed m/s | | | | | | |
|---|---|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Burn of Rothes | 21 | 27 | 29 | 29 | 29 | 29 | 29 |
| Heatherlea | 24 | 29 | 31 | 31 | 31 | 31 | 31 |
| Lynes | 24 | 30 | 32 | 32 | 32 | 32 | 32 |
| Knocknagore | 23 | 29 | 31 | 31 | 31 | 31 | 31 |
| Lyne of Knockando | 23 | 28 | 30 | 30 | 30 | 30 | 30 |
| Aldivonie | 22 | 27 | 30 | 30 | 30 | 30 | 30 |

Table 2: Coordinate locations of the dwelling listed in Table 1

| LOCATION | Easting | Northing |
|---|---|---|
| Burn of Rothes | 325273 | 847814 |
| Heatherlea | 322947 | 844545 |
| Lynes | 321693 | 844349 |
| Knocknagore | 318143 | 845004 |
| Lyne of Knockando | 317602 | 845267 |
| Aldivonie | 317063 | 845397 |

Note to Table 2: The geographical coordinate references are provided for the purpose of identifying the general location of dwelling to which the noise limits apply.

Guidance Notes for Noise Condition 1

These notes are to be read with and form part of the planning condition on noise. The measured data is to be split into bins as described below. The rating level in each bin is the arithmetic sum of the wind farm noise level, any tonal penalty applied in accordance with Note 3 and any AM penalty applied in accordance with Note 4. Reference to ETSU-R-97 refers to the publication entitled "The Assessment and Rating of Noise from Wind Farms" (1997) published by the Energy Technology Support unit (ETSU) for the Department of Trade and Industry (DTI). IOAGPG is “A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise” or any update of that report current at the time of measurement. The IOA Metric is “A Method for Rating Amplitude Modulation in Wind Turbine Noise” dated 9th August 2016 or any update of that current at the time of measurement.

Note 1 – Data Collection

a. Values of the LA90, 10-minute noise index should be measured in accordance with the IOAGPG. Measurements shall be undertaken in such a manner to enable a tonal penalty to be calculated and to allow an AM penalty to be calculated for selected periods where a tonal or AM assessment is required.

b. To enable compliance with the conditions to be evaluated, the wind farm operator shall continuously log arithmetic mean wind speed in metres per second (m/s) and arithmetic mean wind direction in degrees from north in each successive 10-minutes period in a manner to be agreed in writing with the Planning Authority. The wind speed at turbine hub height shall be 'standardised' to a reference height of 10 metres as described in ETSU-R-97 at page 120 using a reference roughness length of 0.05 metres. It is this standardised 10 metre height wind speed data which are correlated with the noise measurements determined as valid. The wind farm operator shall continuously log arithmetic mean nacelle anemometer wind speed, arithmetic mean nacelle orientation, arithmetic mean wind direction as measured at the nacelle, arithmetic mean rotor RPM and whether each wind turbine is running normally during each successive 10-minutes period for each wind turbine on the wind farm. All 10-minute periods shall commence on the hour and in 10-minute increments thereafter synchronised with Universal Time (UT).

Note 2 – Data Analysis

a. The independent consultant shall identify a sub-set of data having had regard to:-

- the conditions (including time of day and corresponding wind directions and speeds) at times in which complaints were recorded;
- the nature/description recorded in the complaints if available;
- information contained in the written request from the local planning authority;
- likely propagation effects (downwind conditions or otherwise);
- The results of the tonality/AM analysis where relevant.

In cases where it is possible to identify patterns of clearly different conditions in which complaints have arisen additional sub-sets may be considered provided this does not introduce unreasonable complexity in the analysis and can be justified by the independent consultant.

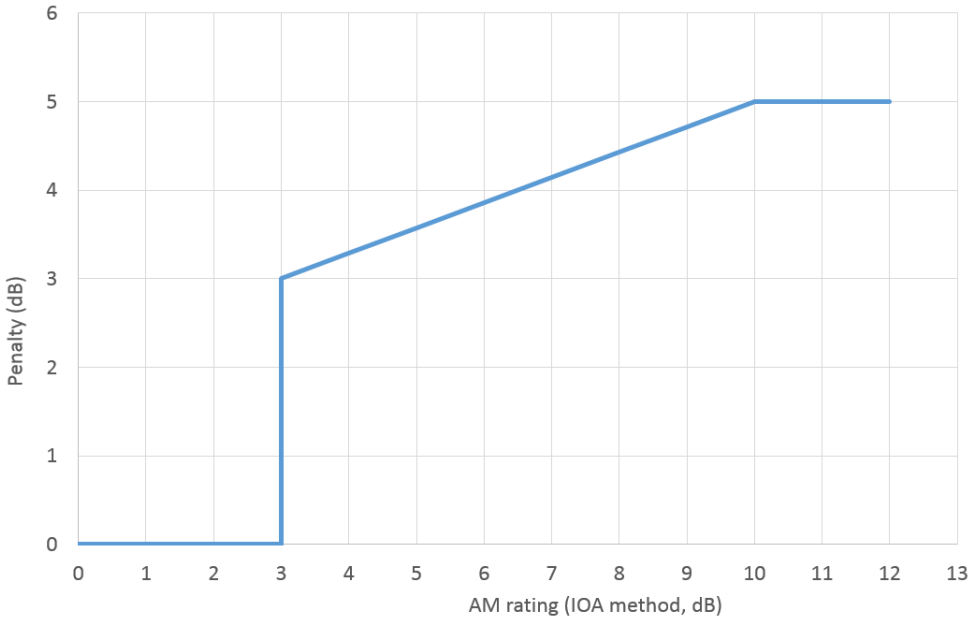
b. Within each of the sub-set(s) of data identified, data shall be placed into separate 1 m/s wide wind speed bins.

Note 3 – Tonal Penalty

a. Where, in accordance with the protocol, the noise contains or is likely to contain a tonal component, a tonal audibility shall be calculated for each ten-minute period using the following procedure.
b. For each 10-minute period for which a tonal assessment is required this shall be performed on noise immissions during 2-minutes of each 10-minute period. The 2-minute periods should be spaced at 10-minute intervals provided that uninterrupted uncorrupted data are available ("the standard procedure").
c. For each of the 2-minute samples the tone level above audibility shall be calculated by comparison with the audibility criterion given in Section 2.1 on pages 104 -109 of ETSU-R-97. Samples for which the tones were below the audibility criterion or no tone was identified, a value of zero audibility shall be substituted. Where data for a ten-minute period are corrupted, that period shall be removed from the tonal analysis.
d. The tone level above audibility for each ten-minute period shall be placed in the appropriate data sub-set and wind speed bin.

Note 4 – AM Penalty

a. Where, in accordance with the protocol, the noise contains or is likely to contain AM, an AM penalty shall be calculated for each ten-minute period using the following procedure.
b. For each 10-minute interval for which an AM assessment is required this shall be performed in accordance with The IOA Metric. The value of AM for each ten-minute period shall be converted to a penalty in decibels in accordance with the graph below and the penalty shall be placed in the appropriate data sub-set and wind speed bin. Where a penalty is zero it should be placed in the bin in the same way.



Note 5 – Calculation of Rating Level

a. The LA90 sound pressure level for each data sub-set and wind speed bin is the arithmetic mean of all the 10 minute sound pressure levels within that data sub-set and wind speed bin except where data has been excluded for reasons which should be clearly identified by the independent consultant. The tonal penalty for each bin is the arithmetic mean of the separate 10-minute tonal audibility levels in the bin converted to a penalty in accordance with Fig 17 on page 104 of ETSU-R-97. The AM penalty for each bin is the arithmetic mean of the AM penalties in the bin. The assessment level in each bin is normally the arithmetic sum of the bin LA90, the bin tonal penalty and the bin AM penalty except where the AM penalty and the tonal penalty relate to the same characteristic (e.g. amplitude modulated tones) when the sum of both penalties may overly penalise the characteristics of the noise. Such cases should be identified and only the larger of the AM or tonal penalty should be applied.

b. If the assessment level in every bin lies at or below the values set out in the Table(s) attached to the conditions then no further action is necessary. In the event that the assessment level is above the limit(s) set out in the Tables attached to the noise conditions in any bin, the independent consultant shall undertake a further assessment of the rating level to correct for background noise so that the rating level relates to wind turbine noise immission only. Correction for background noise need only be undertaken for those wind speed bins where the assessment level is above the limit.

c. The wind farm operator shall ensure that all the wind turbines in the development are turned off for such periods as the independent consultant requires to undertake the further assessment. The further assessment shall be undertaken in accordance with the following steps:-

   i. Repeating the steps in Note 1, with the wind farm switched off, and determining the background noise ($L_3$) in each bin as required in the protocol. At the discretion of the consultant and provided there is no reason to believe background noise would vary with wind direction, background noise in bins where there is insufficient data can be assumed to be the same as that in other bins at the same wind speed.

   ii. The wind farm noise ($L_1$) in each bin shall then be calculated as follows where $L_2$ is the measured level with turbines running but without the addition of any tonal nor AM penalty:

$$L_1 = 10\log\left[10^{L_2/10} - 10^{L_3/10}\right]$$

   iii. The rating level shall be calculated by adding the tonal and AM penalties to the derived wind farm noise $L_1$ in that bin.

   iv. If the rating level after adjustment for background noise contribution and adjustment for tonal and AM penalties in every bin lies at or below the

values set out in the Tables attached to the condition at all wind speeds then no further action is necessary. If the rating level at any integer wind speed exceeds the values set out in the Table(s) attached to the condition then the development fails to comply with the planning condition in the circumstances represented by that bin.

2. There shall be no Commencement of Development unless full details of the proposed wind turbines (including the power rating, sound power levels, and tonality assessment carried out on the selected turbine) have been submitted to the Planning Authority.

3. The wind farm operator shall employ an independent consultant, approved by the Planning Authority, to measure, at the operator's own expense, the level of noise immisions from the wind turbines within the first year of the operation of the turbines, and every two years thereafter, unless and until the Planning Authority extend the period or determine that continued compliance monitoring is no longer required. The measurement procedures, which may include filtering data according to wind direction, shall be agreed with the Planning Authority prior to commencement. The results of any measurement exercise shall be forwarded to the Planning Authority as soon as practicable after the completion of the monitoring exercise. Unless otherwise agreed with the Planning Authority the turbines shall be switched off during part of the monitoring period to permit reliable background noise level data to be determined at the range of wind speeds from 4 m/s to 12 m/s.

4. Construction works (including vehicle movements) associated with the development audible at any point on the boundary of any noise sensitive dwelling shall be permitted between 0700 – 1900 hours, Monday to Friday and 0700 – 1600 hours on Saturdays only, and at no other times out with these permitted hours (including national public and bank holidays) shall construction works be undertaken except where previously agreed in writing with the Council, as Planning Authority and where so demonstrated that operational constraints require limited periods of construction works to be undertaken out with the permitted/stated hours of working.

5. Prior to the commencement of the development and in accordance with Section 5.1.3 of the Environmental Statement Volume 1: Non- Technical Summary of February 2019 by Fred Olsen renewables Limited, a detailed Construction Environmental Management Plan (CEMP) shall be submitted and approved by the Council as Planning Authority.

   Thereafter, the development's construction phase shall be carried out in accordance with the approved details described here.

6. Prior to the commencing of any blasting operations for the formation of borrow pits associated with the development, a scheme for the monitoring of blasting including the location of monitoring points and equipment to be used shall be submitted to the planning authority for written approval. All blasting operations shall take place only in accordance with the scheme as approved or with

subsequent amendments as may receive the written approval of the planning authority.

7. In the event of the formation of borrow pits, blasting times shall be restricted as follows:

   a) No blasting shall be carried out on the site except between the following times (1000 and 1200 hours) and (1400 and 1600 hours) on Mondays to Fridays and (1000 and 1200 hours) on Saturdays.

   b) There shall be no blasting or drilling operations on Sundays, Bank Holidays or National Holidays.

   c) The above condition shall not apply in cases of emergency when it is considered necessary to carry out blasting operations in the interests of safety. The Planning Authority shall be notified in writing immediately of the nature and circumstances of any such event.

8. Ground vibration as a result of blasting operations to form borrow pits at the site shall not exceed a peak particle velocity of 10mms-1 in 95% of all blasts and no individual blast shall exceed a peak particle velocity of 12mms-1 as measured at vibration sensitive buildings. The measurement shall be the maximum of 3 mutually perpendicular directions taken at the ground surface at any vibration sensitive building.

9. At the reasonable request of the Planning Authority, following a complaint relating to vibration from blasting operations to form borrow pits, the developer shall measure at its own expense ground vibration to ensure compliance with the above condition. The results of such monitoring shall thereafter be forwarded to the Planning Authority

10. At the reasonable request of the Planning Authority following a complaint the wind farm operator shall investigate and instigate appropriate mitigation measures to minimise the effects of shadow flicker.

## References


1. Institute of Acoustics. Acoustics Bulletin November/December 2017 “A planning condition for wind turbines”.
2. Institute of Acoustics. A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise. May 2013.
3. Institute of Acoustics Amplitude Modulation Working Group (AMWG) Final Report. A Method for Rating Amplitude Modulation in Wind Turbine Noise. 9 August 2016 Version1.
4. Department of Energy and Climate Change (DECC) Wind Turbine AM Review, August 2016, the Phase 2 Report.
5. Aberdeenshire Council Wind Turbine Development: Submission Guidance Note. Issue 1 February 2015.
6. South Ayrshire Council Wind Turbine Development: Submission Guidance Note.
7. Energy Consents Development Unit
8. Scottish Government Planning Circular 4/1998: the use of conditions in planning permissions.
9. Moray On-shore Wind Energy Guidance (recently amended in October 2020 to the 2020 Local Development Plan as non-statutory guidance)