Save Straiton for Scotland Con - Joined Inquiry - WIN-370-4, 5 & 6 Topic Wind Turbine Noise

Scope of Evidence 03.01.23

The conjoined inquiry scope of evidence for a 4 day noise inquiry, rather than a two day hearing, and the requirement for the developers to produce a conjoined Cumulative Noise Impact Assessment which incorporates operational Assell Valley, Tralorg, Hadyard Hill, Markhill and Dersalloch industrial wind power plants, as well as Kirkhill (under construction) and the proposed Craigenmoddie, Carrick and Knockcronal power plants.

- **Operational noise, methodology for assessment/recognised guidance/industry standards, infra-sound, low frequency noise and**
- **amplitude modulation;**
- **individual and cumulative effects (including with other applications subject to this inquiry and nearby wind farms);**
- **identification of properties most likely to be affected and to what degree; and**
- **the general nature of conditions required in different scenarios (cumulative noise limits/site specific noise limits).**

1. The planning system is intended to protect the health and well being of those who are impacted by planning developments. South Ayrshire Local Development plan adopted in August 2022 on page 79 states:

   *Air, **noise** and light **pollution can have serious effects on health and well-being.** Rather than trying to lessen these effects after a development has taken place, **we think it is more effective to avoid developing areas where these problems could occur.***

   LDP policy: air, noise and light pollution:

   We will not allow development which would expose people to unacceptable levels of air, noise or light pollution.
   Note: In determining planning applications for development that might generate pollution, we'll take the advice of the Council's Environmental Health.

2. The Water of Girvan Valley and the Stinchar Valley, protected areas with hundreds of rural homes will have their residential amenity visually and acoustically severely impacted. Many more than the 'receptors' identified in the EIA are deemed to be impacted to unacceptable levels.

3. SAC recognise the severity of the visual impact of these unprecedented and large scale industrial power plants will have on the residential amenity, therefore, SAC has objected on this significant and material matter.

4. South Ayrshire Council SAC has taken the advice of ACCON and Environmental health to make planning decisions with regard to noise impacts from wind turbine noise on those living in proximity to such developments. ACCON relies on ETSU R 97 and The Good Practice Guide as it states:

The Council's noise consultant, ACCON UK Limited, have been internally consulted to review the submitted documents relating to noise in order to inform Council considerations as whether the noise assessments have been carried out appropriately and to advise on the acceptability or otherwise of the proposals with respect of noise. In their response, ACCON has advised that the methodologies used in the noise chapter represent good practice and are in line with ETSUR-97 (operational noise) and the Institute of Acoustics (IOA) Good Practice Guidance for wind turbines. As part of this, they also endorse the approach to deriving cumulative noise limits and subsequent site-specific noise limits which they conclude are also in line with the same guidance referenced above.

5. We do not consider that ACCON and SAC Environmental health and therefore SAC, are fully informed regarding the detrimental operational impacts arising from the significantly increased size and power levels, both individually and cumulatively of the proposed large scale industrial turbines will have on the acoustic environment. The applicant's Environmental Impact Assessment methodology is severely constrained by only focussing on outdated current noise 'guidance' which fails to consider, monitor or assess the full operational acoustic environmental impacts on Residential Amenity.

6. Extract from Onshore Wind Policy Statement 2022 (OWPS) Issued by the Scottish Government December 2022

3.7. Noise
3.7.1. 'The Assessment and Rating of Noise from Wind Farms' (Final Report, Sept 1996, DTI), (ETSU-R-97) provides the framework for the measurement of wind turbine noise, and all applicants are required to follow the framework and use it to assess and rate noise from wind energy developments.
3.7.2. The Institute of Acoustics (IOA) Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise was published in May 2013 to support the use of ETSUR-97 when designing potential windfarm schemes, and the monitoring of noise levels from generating sites. The Scottish Government recognises this guide as a useful tool which developers can use in conjunction with ETSU-R-97.
3.7.3. ***The Scottish Government is aware that the UK Government has been considering the extent to which ESTU-R-97 may require***

updating to ensure it is aligned with the potential effects from more modern turbines. The Scottish Government supports this work and we anticipate the results of a short-term review project in due course. (my emphasis)
3.7.4. Until such time as new guidance is produced, ETSU-R-97 should continue to be followed by applicants and used to assess and rate noise from wind energy developments.

7. There is recognition in this latest update on onshore wind policy that there is a need for an update for ETSU R 97, yet there is no recognition that this guidance, and its subsequent conditions when approved at planning, does not provide the guaranteed, or substantive protection required to make living close to industrial turbines safe from harm. The proposed Noise Conditions (WTN) are based on the standard ETSU-R-97 Guidance. It is strongly considered that extensive and worldwide experience gained over the time from the date of publication, has show that the Guidance is fundamentally flawed from the outset, as there was no medical expert on the panel, or consideration of potential health impacts from operational turbines. It is abundantly clear the wind turbine blade tip heights have increased from under 50 metres to up to 250 metres plus, and the commensurate generating power output from under 1MW to more than 7 MW, without any notable review of Wind Turbine Noise environmental health impacts. ETSU R 97 only provides for outdated planning conditions, introduced in 1997 when turbines were up to six times smaller and six times less powerful.

8. Current UK Government endorsed planning guidance on WTN comprises just ETSU and the IOAGPG, which consider only audible noise, and does not address infrasound or low frequency noise (ILFN) from wind turbines. ETSU, **published in 1997, referred to infrasound (but only twice), yet the IOAGPG, published in 2013, now makes no mention at all of infrasound.** Both ETSU and the IOAGPG were substantially authored by a group of acousticians affiliated to the Institute of Acoustics, the majority of whom worked primarily as consultants to, or employees of the UK wind industry. **There were no medical experts on the panel.**

9. The 175-page document, titled “The assessment & rating of noise from wind farms,” has an opening statement which is fully transcribed below:

> *This report was drawn up under the direction of the Noise Working Group. While the information contained in this report is given in good faith, it is issued strictly on the basis that any person or entity relying on it does so entirely at their own risk, and without the benefit of any warranty or commitment whatsoever on the part of the individuals or organisations involved in the report as to the veracity or accuracy of any facts or*

statements contained in this report. The views and judgements expressed in this report are those of the authors and do not necessarily reflect those of ETSU, the Department of Trade and Industry or any of the other participating organisations

10. It might now be interesting to list the contributors who knowingly co-signed a document of (self-acknowledged) questionable veracity and accuracy.

Members of the Noise Working Group:

Mr R Meir, Chairman	DTI
Dr M L Legerton, Secretary	ETSU
Dr M B Anderson	Renewable Energy Systems
Mr B Berry	National Physical Laboratory
Dr A Bullmore	Hoare Lea and Partners
Mr M Hayes	The Hayes McKenzie Partnership
Mr M Jiggins	Carrick District Council
Mr E Leeming	The Natural Power Company Ltd
Dr P Musgrove	National Wind Power Ltd
Mr D J Spode	North Cornwall District Council
Mr H A Thomas	Isle of Anglesey County Council
Ms E Tomalin	EcoGen Ltd
Mr M Trinick	Bond Pearce Solicitors
Dr J Warren	National Wind Power Ltd

11. It is of concern that Mr Jiggins is the author of Knockcronal Wind Farm.
Technical Appendix 10.1 Environmental Noise Assessment. REVISION 4 – 15 NOVEMBER 2021 AUTHOR: MARK JIGGINS MSc MIOA
His statement on page 2 is also of questionable veracity:

"This document has been prepared for Statkraft UK Ltd only and solely for the purposes expressly defined herein.
We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, *save only for liabilities that cannot be so excluded by operation of applicable law.*
*(*My emphasis)

How can this inquiry rely on any of the content of this document?

12. Who represented the medical community on the ETSU committee?

If no medical expertise was relied upon, why is ETSU-R-97 presumed to incorporate the protection of Public Health against wind turbine noise? ETSU-R-97 does not cover health effects that may arise due to wind turbine noise exposure therefore, how is it possible for reporters to provide consent that will guarantee safeguards and protection to the public?

13. Our team has the expertise to challenge the Noise Environmental Impact Assessment (NIA) data submitted by the 3 Applicant', l with reference to ETSU standards.

Witness: William Leslie Huson BSc (Hons) MSc CPhys MInstP MIoA MAAS. Applied Physics, UK.

- Background: MSc Sound and Vibration Studies, Institute of Sound and Vibration Research, Southampton, UK
- Certificate of Competence in Workplace Noise Assessment
- Member of the Institute of Physics, UK
- Affiliations: Chartered Physicist, UK
- Member of the Institute of Acoustics, UK
- Member of the Australian Acoustical Society

- Member of the AV003 and AV004 acoustics working groups for Standards Australia since 2001 (now combined into AV0001)

  Australian representative for the International Institute of Noise Control Engineers (I-INCE) Technical Study Group 5 A GLOBAL APPROACH TO NOISE CONTROL POLICY (Now disbanded after completion of the scope of work defining this group – see http://www.i-ince.org/data/iince061.pdf)
- 44 years of professional acoustics consulting experience covering terrestrial and underwater acoustics in a wide range of industries with expertise in sound and vibration measurement, noise and vibration modelling and compliance assessments. I have experience as an expert witness at Planning Tribunals/Courts, in the High Court and have been invited to provide submissions to two Senate Inquiries.

14. Mr Huson states:

"The three noise impact assessment reports were prepared by separate companies on behalf of the respective proposed wind farm developments. The reports total some 171 pages and cross reference various technical issues and approaches, in part, between the authors. However, there are significant differences in terms of the choice for appropriate sound level targets for the purposes of assessing development compliance. Ambiguities exist and there are concerns over the validity of background sound level measurements that have been used to determine target noise limits for at least two of the proposed developments.

Once our report is prepared, that will highlight areas of concern in the noise impact assessments, then the Reporters will need sufficient time to explore the issues raised.

We believe that a time allocation of 2 days for the subject of noise will not be sufficient to adequately explore the issues and request that the 2 day allocation be extended to 4 days."

15. In respect of Amplitude Modulation.

We will submit substantive and material evidence both written and orally at the Inquiry, which will challenge and contest the unsustainable position of the applicants, which put at risk the health and wellbeing of affected residents and the local community.

We will substantively contest the position statements within the following NIA's:

Carrick Wind Farm. Environmental Impact Assessment Volume 1.

9.3 Consultation. Para 91 Table 5. Extract:

Wind turbine low frequency noise, infrasound and excess amplitude modulation.

"It was agreed that the assessment of wind turbine low frequency noise and infrasound should be scoped out of the assessment on the basis that guidance referenced by Scottish Planning Policy that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines".

It was also agreed that an assessment of excess amplitude modulation could be scoped out on the basis that guidance referenced Scottish Planning Policy found low incidents of AM and the numbers of people adversely affected in the UK.

Craiginmoddie Wind Farm.

Environmental Impact Assessment Report – Volume I Chapter 10: Noise

Wood on behalf of Energiekontor UK Ltd | December 2020 22

Amplitude Modulation

10.70 The RenewableUK research programme on amplitude modulation (AM) has concluded[3] that high levels of AM can occasionally be heard at long distances from turbines. While the mechanisms of EAM are well documented, an industry consensus on a methodology for its prediction is yet to be reached. It is noted that at this time Government advice towards the assessment of EAM has not changed from that included within the ETSU-R-97 Guidance, which indicates no specific consideration for EAM is required and no planning condition is necessary.

Knockcronal Wind Farm.

Technical Appendix 10.1 - Environmental Noise Assessment.

Revision 4 – 15 November 2021 author: Mark Jiggins MSC MIOA.

5.9 Low Frequency Noise, Vibration and Amplitude Modulation

5.9.1 Low frequency noise and vibration resulting from the operation of wind farms are issues that have been attracting a certain amount of attention over recent years. Consequently, Annex A includes a detailed discussion of these topics. In summary of the information provided therein, the current recommendation is that ETSU-R-97 should continue to be used for the assessment and rating of operational noise from wind farms.

5.9.2 Annex A also discusses the most recently published research on the subject of wind turbine blade swish Amplitude Modulation (or AM). A penalty-type approach to account for instances of increased AM outside of what is expected from 'normal' blade swish has been proposed. This approach is a consequence of the combined results of this research and, in particular, the development by the IOA of an objective technique for identifying and quantifying AM noise, as well as a review of the subjective response to AM noise by a Government-commissioned research group. Some uncertainty remains at this stage over the application of such a penalty and this will be subject to a period of testing and review over the next few years.

16. Our team Includes Professor Mariana Alves Pereira Professor Degree in Physics, Masters in Biomedical Engineering and Doctoral in Environmental Sciences.

A founder member of the International Acoustics Research Organization IARO, an international group of researchers with a mission to investigate acoustical environments, especially with respect to features that affect humans and animals, and to publish the results. IARO holds the ethics approval for the CSI-ACHE, the Citizen Science Initiative into Acoustical Characterisation of Human Environments, the results of which are publicly disseminated.

The International Acoustics Research Organization represents a group of scientists who, collectively, hold over 200 years of scientific experience in the field of infrasound and low frequency noise, and its effects of human health. Since 2016, IARO researchers have been recording and analysing acoustical data in and near homes located in the vicinity of onshore wind power stations, in the following countries (alphabetical): Australia, Canada, Denmark, England, France, Germany, Ireland, New Zealand, Northern Ireland, Portugal, Scotland, Slovenia, and The Netherlands. Prior to 2016, all IARO scientists were already working either in acoustics alone or in acoustics and health. All research conducted by IARO is part of the Citizen Science Initiative for Acoustic Characterization of Human Environments (CSI-ACHE).

17. The recording equipment Is a SAM Scribe Full Spectrum (FS) system (Soundscape Analytics, Palmerston North, New Zealand), Model Mk2 is being used in Scotland. It is a two-channel device with sampling rates up to 44.1 kHz, that is designed to capture recordings of sonic environments with high precision, especially in the infrasonic and low-frequency bands. Data streams are delivered via USB to a Windows notebook computer and stored as uncompressed wav files to a hard disk. GPS information is stored in the files as metadata, which also include a digital signature. Each wav file corresponds to a 10-minute (600-seconds) recording of the sonic environment. The system can accurately record from 0.1–1000 Hz, as per the manufacturer frequency response of the two electret condenser microphones.

All measurements reported here cover the range from 0.5–1000 Hz and were captured with a sampling rate of 11.025 kHz. All recordings included a standard reference calibration tone at the start and end, produced with a Type I calibrator (part of the SAM Scribe system) at 1000 Hz/94 dB.

Calibration of the SAM Scribe system rests on 1) the manufacturer's frequency-response curve for the microphone and 2) calibration against a certified Larsen-Davis 831 sound level meter in the range of 6.3-1000 Hz.

18. Susan Crosthwaite and Grosvenor Consultancy are researchers operating SAM drawing on the expertise and experience of IARO.
SAM not only gathers the data to be analysed by the IARO team, but it allows us to compare the acoustic environment in A Weighting and Unweighted data.

Figure 1

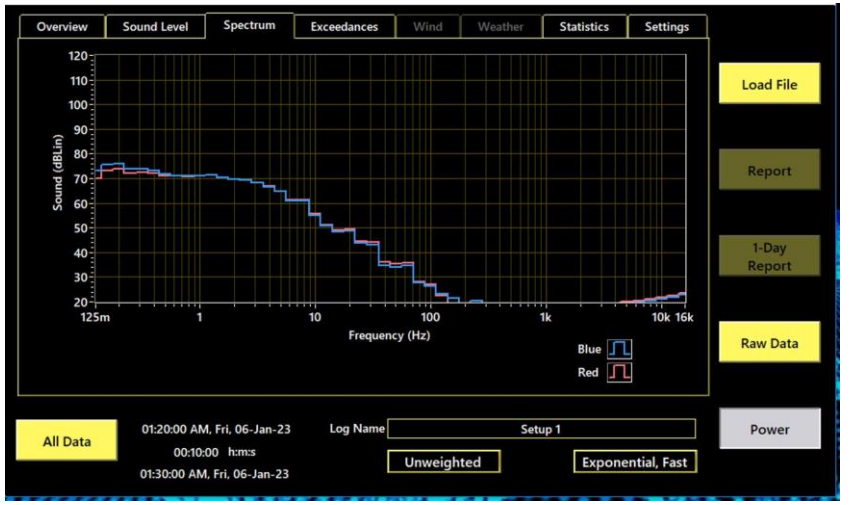


Figure 2

Here we have four screen shots of SAM recording data: Figures 1 and 2 from 01.20am – 01.30am on 6th January 2023 – above and Figures 3 and 4 from 14th November 2022 at different homes close to Straiton and potentially could be impacted by the applications. Figure 1 and 3 show the acoustic environment when only A weighting is used to examine the data. They show very low levels of audible noise and nothing in the lower frequencies. Figure 2 and 4 are the recording measurements unweighted showing the full acoustic environment at the locations. We can see very high levels of all the lower frequencies (this could be from Dersalloch wind power plant).

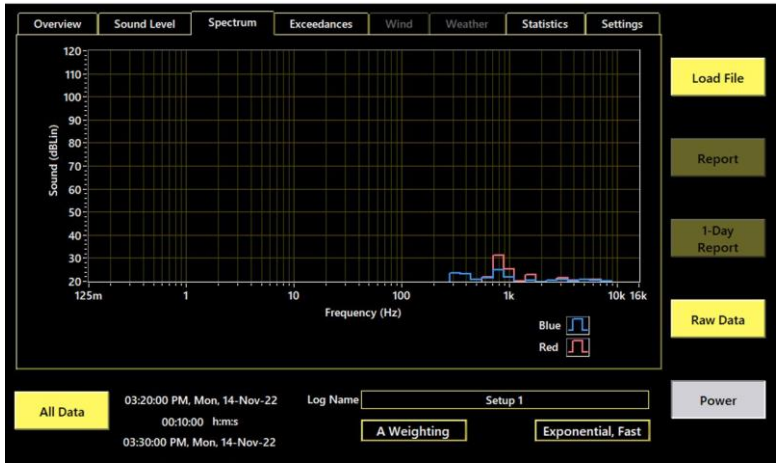


Figure 3

Figure 4

19. The following published, peer reviewed Chapter (Appendix 1) and Whitepaper (Appendix 2) explains what this data tells us:
Chapter Infrasound Exposure: High-Resolution Measurements Near Wind Power Plants Huub Bakker, Mariana Alves-Pereira, Richard Mann, Rachel Summers and Philip Dickinson.
(Appendix 1) The Abstract, introduction and conclusion have been included here, but it is essential that the reporters read the whole chapter.

Abstract

This chapter focuses on infrasonic (20 Hz) noise exposure as captured in and around homes located in the vicinity of wind power plants. Despite persistent noise complaints by local residents, no satisfactory acoustical event has yet been identified to justify this troublesome (worldwide) situation. Continuous (days), high-resolution recordings—spectral segmentation of 1/36 of an octave and 1-second temporal increments— have been acquired in many homes across the world revealing the presence of wind turbine acoustic signatures. These consist of trains of airborne pressure pulses, identified in the frequency domain as harmonic series with the fundamental frequency equal to that of the blade-pass frequency of the wind turbine. This report documents three such cases (Portugal and Scotland). The highest peaks of the wind turbine acoustic signature (up to 25 dB over background noise) occurred within the 0.5–5 Hz window which is classically defined as below the human hearing threshold; and yet these 'inaudible' phenomena appear to trigger severe biological reactions. Based on the prominence of the peaks in the harmonic series, a new measure is

proposed for use in determining dose–response relationships for infrasonic exposures. This new methodology may be applicable to infrasonic exposures in both environmental and occupational settings.

Introduction

Hearing loss, speech intelligibility and noise annoyance are some of the most studied impacts of noise exposures on human health and well-being. A common denominator of these three outcomes is the audibility of the sound. Exposure to loud noise over extended periods of time can cause hearing impairment; noisy environments can interfere with the correct understanding of speech; and certain types of continuous or intermittent sounds can cause people to feel annoyed by noise, which can, in turn, exacerbate underlying disorders or diseases. There are, however, additional features of sonic environments that are unrelated to the human audibility of sound, but that can also deleteriously affect human health and well-being, specifically, infrasound (20 Hz).

Conclusions

This chapter provides a different approach to the measurement and analysis of infrasound in and around homes located in the proximity of wind power plants. Examples show how using higher temporal- and spectral-resolutions (1 second and 1/36 of an octave), and without any frequency weighting, can reveal acoustical features in the infrasonic range that may indicate a causal relationship with self-reported medical symptoms. This possibility is usually considered non-existent since the infrasonic range is generally viewed as inaudible, and thus innocuous, to humans. The suggestion therefore arises that current noise protection procedures are insufficient to protect public and occupational health. The approach used by these authors offers a more solid framework with which to pursue the establishment of dose–response relationships for infrasonic exposures. Future studies are being extended into noisy occupational environments and different environmental settings where wind power is not the acoustic source.

20. **The White Paper** Appendix 2

Preamble Harmonic series are rare in nature. They are far more commonly associated from human activity. This paper looks at several measures that can be calculated from harmonic series, more specifically those that can be calculated from the frequency spectrogram of a recording.

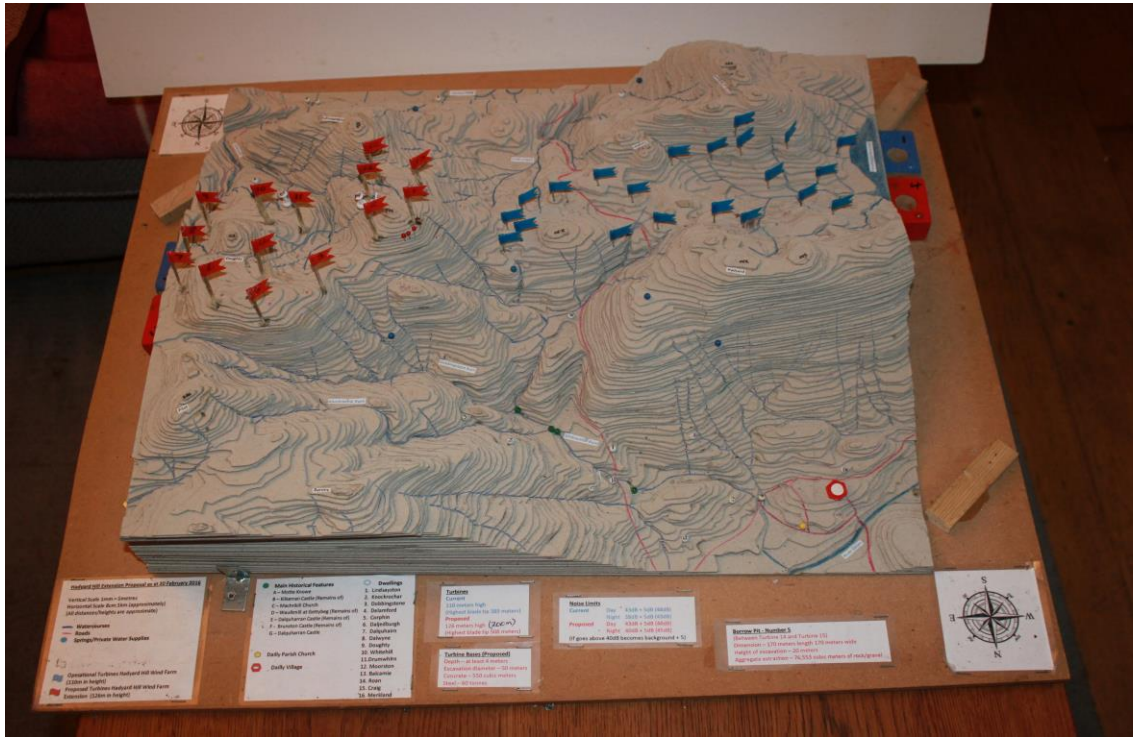
Two separate classes of metrics are considered; those that deal with the SPL of the series and those that deal with the prominence of the series above the sound background.

The definition of prominence for these metrics comes from the Matlab function 'findpeaks,' which returns a list of peaks from (in this case) the 1/36th-octave, narrow-band-filter frequency spectrum of a sound file. The prominence of these peaks is defined as part of this function and reproduced in the appendix.

21. If we are able to measure the full acoustic environment and show evidence of harm, why is it not possible for the wind industry to do the same? It is their responsibility to prove that their turbines will not cause unacceptable levels of environmental acoustic pollution, which scientifically includes the impact of low frequency noise and infrasound.

22. The impact of topography has a substantive impact on the wind turbine sound propagation. All these three applications have separate and cumulative implications for homes and communities.

Figure 5 contour model of Hadyard Hill and Criagenmoddieand turbines by E. Traynor



23. **Sound Propagation**: Sound is fluid, and although the wind industry may claim that the hills can act as a barrier, the sound waves will take the path of least resistance and Figure 5 demonstrates how the topography forms channels which already funnels the acoustic power from Hadyard Hill (blue flags on the model accurately sited) towards the village of Daily, as well as residences on the valley sides. Craigenmoddie (red flags on the model accurately sited) will propagate towards the village of Daily and in the other direction towards the village of Barr. There are similar implications for Carrick and Knockcronnal on Straiton individually and cumulatively. We will want to use this model at the inquiry.

24. **Wind Turbine Noise Complaints**: There were 89 wind turbine noise complaints to SAC up to April 2022. A FOI is currently requesting an update. Many of these are about the turbines which will form part of the cumulative impact.

25. **Site visits** We consider that Noise Amenity must be incorporated into the accompanied site visits (properties listed in Appendix 3) which must include visits to the villages of Straiton, Daily, and Crosshill in the Girvan Valley and the village of Barr in the Stinchar Valley. There are 685 homes registered to the associated postcodes. We are prepared to demonstrate SAM during the visits which will allow the reporters to see the acoustic environment at various locations.

    We also request an unaccompanied site visit to Arnicle Farm, Barr Glen, Mull of Kintyre, subject to prior arrangement.

26. **Conditions:** We consider that the Noise conditions must include protection for all levels of immissions in the acoustic environmental. We wish to participate in the Conditions session and we will make a submission by 17th February.

27. **For all the above reasons we request a 4 day inquiry for the topic of Noise.** We would request hybrid inquiry sessions as the internet connection is not reliable for all, we require to use the above model and large topographical maps. However at this moment in time Mr Huson, currently in Australia, and Professor Alves Pereira who is resident in Portugal cannot guarantee their physical presence.

- We request copies of all the background full noise data from all three applicants for all identified noise receptor properties - asap.

- We request 10km and 20km cumulative sound pressure level contour maps from the centre point of the line of wind power plants (from west to east) Assel Valley/Tralorg/Hadyard Hill /Craiginmoddie/Carrick/Knockcronnal and Dersalloch to include all the wind power plants operational, under construction and in planning. These must show the full extent of all the noise contours in all directions.

END.

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Appendix 1 Chapter Infrasound Exposure: High-Resolution Measurements Near Wind Power Plants Huub Bakker, Mariana Alves-Pereira, Richard Mann, Rachel Summers and Philip Dickinson.

Appendix 2 The White Paper – this is a draft copy and will be replaced in due course

Appendix 3 Site Visits