



Independent Noise Working Group

**Wind Turbine Amplitude Modulation &  
Planning Control Study**

**Work Package 8 - Review of Institute of Acoustics  
Amplitude Modulation Study and Methodology**

**Author: Richard Cox**

© 2015 Richard Cox & Chris Heaton-Harris. No part of this Study may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise except through the prior written permission of the authors. Limit of liability: While the authors have used their best efforts in preparing this Study, they make no representations or warranties with respect to the accuracy or completeness of its contents and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. The advice and strategies contained herein may not be suitable for your situation.

### Objective:

To review and summarise the activities of the Institute of Acoustics and its Noise Working Groups with respect to wind turbine noise amplitude modulation.

### Contents

1. Executive Summary
2. Preamble
3. AMWG Formation – 1 August 2014
4. Work Scope Release – 21 October 2014
5. Complaint Letters to the Engineering Council and IoA
6. DECC study into Amplitude Modulation tender
7. AM Consultation
8. Conclusion
9. Bibliography

### Abbreviations

|           |   |
|-----------|---|
| AM        | Amplitude Modulation (of ‘sound’ pressure waves)  |
| AMWG      | (Wind turbine noise) Amplitude Modulation Working Group of the IoA  |
| BSI       | British Standards Institute   |
| DECC      | Department of Energy and Climate Change   |
| EHO       | Environmental Health Officer  |
| ETSU-R-97 | The Assessment and Rating of Noise from Wind Farms, The Working Group on Noise from Wind Turbines, September 1996 |
| ETSU      | as above  |
| EAM       | Excess amplitude modulation   |
| FoI       | Freedom of Information  |
| GPG       | Good Practice Guide (IoA update of ETSU-R-97)   |
| ISVR      | Institute of Sound and Vibration Research   |
| INWG      | Independent Noise working Group   |
| IoA       | Institute of Acoustics (UK)   |
| LFN       | low frequency noise   |
| MAS       | MAS Environmental Ltd, an acoustics consulting company  |
| NWG       | (Wind Turbine) Noise Working Group of IoA   |
| EHO       | Environmental Health Officer (usually working for a local authority)  |
| REF       | Renewable Energy Foundation   |
| RES       | Renewable Energy Systems, wind farm developer company   |
| ReUK      | RenewableUK, wind industry trade association  |
| SGN       | Supplementary Guidance Note (to the IoA Good practice Guide)  |

### 1 Executive Summary

1 The announcement on 1 August 2014 by the Institute of Acoustics (IoA) that it was forming a new amplitude modulation working group (AMWG) to study and report on wind turbine noise amplitude modulation (AM) was met with a great deal of scepticism by the resident groups fighting for protection against wind turbine noise. It was this announcement that resulted in the creation of the Independent Noise Working Group (INWG) and our independent AM study.

2 Ever since the current wind turbine noise guidelines known as ETSU-R-97 were produced by a joint wind industry and government committee during the mid-1990s there have been repeated accusations of conflict of interest aimed at the IoA noise working groups and the relatively small group of acousticians involved in wind power development. This small group of acousticians, who are effectively part of the wind industry supply chain, have managed to dominate the IoA and government policy regarding wind turbine noise assessment.

3 As a result more permissive noise assessment guidance exists for wind turbines than for any other form of industrial activity and, unusually, this guidance allows for higher noise levels at night than during the daytime. It is therefore not unsurprising that, as demonstrated in the INWG work packages 3.1 and 3.2, there is a much higher incidence of noise complaints and reports of the harmful effects arising from wind turbine noise than the wind industry has admitted.

4 Since the launch by the IoA of their AM study, their schedule has continued to slip and the scope has changed significantly. Initially the main objective of the AM study was to develop a standard planning condition with threshold limits and penalties for AM that would be included as a Supplementary Guidance Note (SGN) to the IoA Good Practice Guide (GPG). The original schedule indicated a consultation period starting during September with completion of the study by the end of 2014.

5 During October 2014 the IoA AM study scope changed to exclude the planning condition thresholds and penalties. The remaining objectives related to the measurement process to identify and quantify AM. Additionally, two members of the main IoA NWG (Cand and Davis) were added to the already wind industry dominated AMWG. The study schedule was also extended with the consultation period delayed from September 2014 to February 2015

6 Additionally, during late 2014 the Engineering Council received more than 20 complaint letters concerning alleged unprofessional and unethical conduct by the IoA NWG. Most if not all of these complainants had experience of challenging wind turbine industry noise assessments.

7 Coincident with these complaints, the IoA published a statement on its web site during December 2014 that included a defence of the ETSU Good Practice Guide (GPG) and the methodology adopted by their NWG for the treatment of wind shear during the noise assessment process. The IoA statement included; *“This methodology had been subjected to*

*substantive scrutiny and debate at a number of inquiries in front of planning inspectors, but the counter evidence was dismissed, and the methodology became accepted practice*". The implication of this statement is that the IoA, a supposedly professional body licenced by the Engineering Council, would appear to be satisfied to allow Secretary of State appointed Planning Inspectors, who have little or no acoustic knowledge, to determine the scientific arguments relating to wind shear.

8 With reference to the GPG consultation, the IoA statement continued with: *"It had been the working group's intention to provide a full rebuttal of information that was submitted that was not judged to represent 'good practice'. However, the working group considered that the various consultation responses had already been presented to a number of public inquiries where rebuttal evidence and inspectors reports from these inquiries already addressed all the points raised and that this information was already in the public domain"*. Once again the IoA position is absurd and untenable; no other professional, let alone scientific body would delegate the responsibility of technical rebuttal to a planning inspector whose expertise is in Town Planning.

9 After further delay, the IoA AMWG finally released their AM study consultation documents on 23 April 2015 with a closing date for comments of 30 June, indicating the study would be completed by the end of 2015. These proposals present serious concerns to anyone requiring a scientific discussion and resolution to the AM noise problem. These concerns include:

- The consultation takes a very narrow view of the AM issue ignoring the vast body of scientific evidence as reviewed and summarised at WP 2.1. The IoA consultation ignores any low frequency or infrasound components by filtering out data below 100 Hz. Any mention of low frequency noise (LFN) or infrasound is conspicuously absent.
- There is no mention of any intention to measure AM inside homes where the greatest impact is usually experienced.
- There is a clear AMWG preference for an automated method based on analysis in the frequency domain at blade passing frequency. However, this method ignores sound components outside the imposed limits allowing significant scope for opacity and under-measurement of AM.
- There is also a failure to recognise that the Class 1 instrumentation recommended by the IoA is unsuited for the low background noise environments and low frequency requirements that may be necessary when measuring wind turbine noise. This is due to the instrumentation's limited noise floor and frequency range.

10 The recent decision by DECC to award the contract for an 'independent study into AM' to WSP / Parsons Brinckerhoff ensures that Richard Perkins as Technical Director of the Acoustics, Noise & Vibration Team at WSP / Parsons Brinckerhoff and also as Chairman of the IoA NWG and a senior member of the IoA Council is now able to influence both AM studies. The conclusion to be drawn is from all of the above is that the long term wind industry strategy of obfuscation, whilst capitalising on the IoA's trusted and respected position as a scientific institution is set to continue.

## 2 Preamble

11 The current guidance to planning authorities for the noise impact assessment of wind turbines is provided by a document known as ETSU-R-97 (ETSU). ETSU was produced jointly by Government and wind industry representatives and was published during 1997. It provides more permissive noise restrictions than would have been allowed by the then existing British Standards Institute (BSI) BS4142: 1990 as applied for all other forms of industrial development. It should be noted that the authors of ETSU rejected use of BS4142:1990 partly on the grounds that it did not apply to developments where the background masking noise was less than 30dB. In fact the revision to BS4142: 1997 closed this deficiency, and as professional acousticians it is surprising that the ETSU authors seem to have been unaware of this change when the original ETSU document was released. The resulting, more permissive, noise assessment methodology provided by ETSU is defended at page 43 of ETSU by the statement that it was : *‘thought to offer a reasonable degree of protection to wind farm neighbours without placing unreasonable restrictions on wind farm development’*.

12 Almost twenty years later, ETSU still provides the official guidance for wind turbine noise assessments and has not been revised since 1997 other than by the introduction of a mandatory 10m height standardised wind speed in the 2013 Good Practice Guide, supposedly to account for wind shear. ETSU remains despite widespread criticism (Bowdler July 2005, Cox, Unwin & Sherman, July 2012). Most recently a Northern Ireland Assembly report (NIA Jan 2015) recommends in the strongest terms that:

***“the use of the ETSU-97 guidelines should be reviewed on an urgent basis by the Department and that more appropriate guidance should be put in place”.***

13 Despite the widespread criticism of ETSU, the UK Government Department of Energy and Climate Change (DECC) commissioned the Institute of Acoustics (IoA) during 2012 to produce a Good Practice Guide (GPG) for ETSU, so in effect ignoring the calls for its replacement. The IoA through its wind turbine noise working group (NWG) subsequently launched a study and consultation during July 2012. The consultation process was later shown to be superficial and was heavily criticised (see for example Cox, Unwin, Bingham & Greenough, March 2013) for the way it ignored scientific arguments from qualified sources that failed to agree with the agenda of the NWG and wind industry. There was no attempt to provide a scientific justification for the NWG’s conclusions and no credible peer review process.

14 A major failing in both the GPG consultation and final report was that they did not consider excess amplitude modulation (EAM), the most troublesome and intrusive feature of wind turbine noise. This was justified by the NWG by reference to an on-going study of the phenomenon being sponsored by the wind industry trade association RenewableUK (ReUK).

15 ReUK commenced their EAM study during 2010 but its results were not finally released until late 2013 (ReUK, December 2013), and after the IoA GPG report release during May 2013. It then became apparent that the ReUK study had been completed and

## Work Package 8 – Review of IoA AM Study & Methodology

the report release withheld for over a year. This coincided with the same time period as the IoA GPG consultation.

16 It was also evident that some of the same acousticians were working simultaneously on both the IoA GPG and the ReUK EAM study and thus, by early 2013, must have been familiar with at least some of the findings of the various ReUK study ‘work packages’. During this same period, at public inquiries into wind farm planning applications, some of these same acousticians continued to claim that EAM was infrequent and continued to deny that it was a problem. Meanwhile the IoA ruling council continue to ignore complaints highlighting this disregard of the Institute’s own ethical code of conduct by its members. In this respect, the IoA would appear to be compromised by the having the Chairman of the NWG as a senior member of its ruling council.

17 The ReUK report contained an admission that EAM is a problem ‘*too large to ignore*’. (ReUK, 2013, page 436) However, the report also included a proposed planning condition, which it was claimed would control EAM. At a subsequent IoA workshop held during March 2014 to discuss the ReUK report and AM generally, the report and the proposed planning condition received severe criticism (Stigwood, March 2014; Cox, March 2014).

18 The ReUK AM study was commissioned shortly after an unprecedented, stand-alone EAM noise condition was imposed by a Planning Inspector during December 2009, when granting planning approval for the Den Brook wind farm. The Den Brook EAM planning condition has since been ratified by the Court of Appeal but the Den Brook developer, RES, has since made three moves clearly aimed to water-down and significantly vary it.

19 Meanwhile the nine 120m high Den Brook turbines still remain to be constructed, 5 years on from the granting of planning approval. Of particular note is that RES’s chief technical officer, Dr Jeremy Bass, who project managed the ReUK EAM study, was amongst the foremost architects behind both RES’s Den Brook moves and ReUK’s proposed AM planning condition. He is also a member of the IoA’s NWG. INWG work package WP4 gives details of the Den Brook wind farm.

20 The evidence subsequently provided by the Renewable Energy Foundation (REF, Moroney & Constable, March 2014) and independently by MAS Environmental is that neither of these EAM planning conditions as proposed by ReUK and RES provides remotely adequate protection for people living near wind turbines. These authors show that the ReUK EAM planning condition is a charade aimed at convincing planning decision makers to adopt it, relying on the professional credibility of association with the Institute of Acoustics.

21 There is now reason to believe that the wind industry setbacks experienced at Den Brook, combined with opposition to the proposed ReUK EAM planning condition, provided the justification for the wind industry via the IoA to initiate their new AM study. Based on past performance, there is good reason to believe the IoA NWG (via the AMWG) will attempt to formalise as the ‘standard’ an EAM planning condition similar to the ReUK or RES’s proposed Den Brook variations that will give the impression of offering protection but in practice will be benign and wind industry friendly.

### 3 AMWG Formation – 1 August 2014

22 On 1 August 2014 the IoA Noise Working Group (NWG) ([Perkins Aug 2014](#)) released their 7 page AM working group options document and a 3 page terms of reference document. The document release was accompanied by the following news release on the IoA web site:

#### ***“FORMATION OF AM WORKING GROUP***

*The IOA has formed an amplitude modulation (AM) working group as a sub-group of the wind turbine noise working party.*

*Gavin Irvine, of Ion Acoustics, is the chairman. Other members will include acousticians working for developers, local authorities and objector groups.*

*It aims to review methods to quantify and assess AM in wind turbine noise. This review will include: the AM work funded by R-UK; the “Den Brook” condition and other historic and emerging research. A further aim is to progress a preferred metric from those considered and a preferred methodology for assessing AM.*

*As a first step, the group will produce an options paper for consultation, which is due to be published in September. A workshop is also planned for November to allow members and interested parties to participate in the process, shortly after which a recommendation will be made on a preferred metric and methodology.”*

#### **Terms of Reference and Options Documents**

23 In the Options Document some key points are:

- The IoA NWG consists of 5 members as were originally named of whom 3 are acoustics consultants working directly for the wind industry, one is a wind industry funded researcher and acoustician, and the 5<sup>th</sup> is an EHO seconded to the group.
- There is no working group member who might be seen to represent the genuine interests of people affected by wind turbine noise.
- The objective of the EAM study was given as to develop a standard planning condition for EAM and that this would be included as a Supplementary Guidance Note (SGN) to the IoA Good Practice Guide (GPG) and so become hard wired into the formal planning process.
- 11 work plans were specified detailing AM definition, target audience, data and literature review, comparison of methods of measuring AM, data requirements, definition and analysis, software and processing, psycho-acoustic response and administration.

24 The Terms of Reference document describes the responsibilities of the AMWG in line with the Options Document described above. The key tasks are:

- To produce a draft of a SGN providing an AM planning condition
- Consult with the IoA membership and others;
- Then finalise the SGN.

#### 4 Work Scope Release – 21 October 2014

25 The earlier press release stated: *“As a first step, the group will produce an options paper for consultation, which is due to published in September”*. This options paper failed to materialise during September and then on 21 October the IoA made the following announcement ([Perkins, October 2014](#)) on its web site:

##### ***“AM GROUP PUBLISHES DOCUMENTS***

*The Institute of Acoustics' Working Group on Amplitude Modulation in Wind Turbine Noise has now published its scope of work and terms of reference documents. These include details of the proposed plan of work and the membership of the group.”*

26 So, a month later than previously stated, instead of a September consultation document the IoA simply released an updated terms of reference document and an outline scope of work, which was a renamed and updated version of the earlier options document.

27 In the revised terms of reference document the key changes are:

- The study programme was extended with the release of the documents for consultation delayed from September 2014 to February 2015;
- This would be followed by a 6 week consultation period with the final documents to be ready for approval by the IoA during May 2015.

28 In the revised scope of work document the key changes are:

- The goals have been subtly but significantly changed to exclude the planning condition thresholds and penalties;
- The AMWG membership is increased to include two acousticians from the main IoA NWG (Cand and Davis) both of whom are acousticians employed or funded indirectly by the wind industry. This move alone will have further consolidated the wind industry control of the study;
- The intended IoA literature review now includes consideration of work by MAS Environmental Ltd. It should be noted that previously the NWG refused to include Mike Stigwood of MAS in its membership.



29 The domination of the AMWG by the wind industry supply chain and consequential potential conflict of interest became quite obvious at this point. Surely this must conflict with the IoA and Engineering Council codes of conduct? In summary, at this time the AMWG membership and affiliations were as follows:

- Gavin Irvine (Chair) of Ion Acoustics who frequently act as consultants to the wind power industry;
- Matthew Cand of Hoare Lea Acoustics, a leading acoustics consultancy to wind power developers, and who is also a member of the IoA NWG and a key participant in the ReUK AM study;
- Bob Davis of Robert Davis Associates, who is closely associated with the University of Southampton Institute of Sound and Vibration Research (ISVR) that routinely obtains funding from the wind industry. Davis is also a member of the IoA NWG and stands behind the Good Practice Guide. He also participated in the ReUK AM study but has on occasions represented wind power objectors;
- Dave Cole of 24 Acoustics, who act as consultants to the wind industry;
- Sam Miller of Xi Engineering an acoustic and vibration consultancy to the wind power industry;
- Tom Levet of Hayes McKenzie Partnership, which is a leading acoustics consultancy to wind power developers;
- John Shelton who is Managing Director of AcSoft, a supplier of instrumentation hardware and software to the acoustics industry and is closely associated with the ISVR;
- Jeremy Bass of RES, a leading wind power developer. Bass is also the main architect of the ReUK AM planning condition and the proposed alternatives to the Den Brook AM planning condition;
- David Sexton of West Devon Borough Council who has recommended that his Local Planning Authority approve developer formulated amendments that residents, on their own professional advice, fear will undermine the established Den Brook AM condition;
- Geoff Leventhall, an acoustics consultant closely associated with the IoA NWG and the wind power industry for many years.

## 5 Complaint Letters to the Engineering Council and IoA

30 During the period between the first and second IoA press releases described above, a significant number of complaint letters (The INWG is aware of more than 20) were sent to the Engineering Council claiming unprofessional and unethical conduct related to failure to declare possible conflicts of interest by the IoA NWG. Most, if not all, of these complainants had experience of challenging wind turbine noise assessments at planning public inquiries. These letters were sent to the Engineering Council during early September but were not responded to for 7 weeks. The response eventually received from the Engineering Council was disappointing as they abdicated their responsibilities by referring the complaints to the

formal IoA complaints procedure. This in effect was to ask the IoA to investigate its own possible failures.

31 In early November 2014 some of the complainants resubmitted their original complaints to the IoA. However, it seems too much of a coincidence that the IoA NWG made significant changes to their AM study strategy during this September to October period including:

- The stated goals of the IoA AM study scope of work document issued on 21 October 2014 were modified to exclude the planning condition thresholds and penalties. See DECC study into AM discussed below;
- Wind industry control of the AMWG was strengthened by the addition of Cand and Davis from the main wind turbine NWG; and
- The final report target date was delayed from Dec 2014 to May 2015.

32 The IoA responded to these complaints on 22 December. However, the lengthy letter failed to address to key issues of concern.

33 The IoA response letter referred to a statement published on their web site dated 19 December 2014 ([IoA Dec 2014](#)). This defensive statement contains some unexpected claims by a supposedly professional institution. Under the heading 'The IOA Bulletin Method' it states; *"This methodology had been subjected to substantive scrutiny and debate at a number of inquiries in front of planning inspectors, but the counter evidence was dismissed, and the methodology became accepted practice"*. The implication of this statement is that the IoA is satisfied to allow planning inspectors who have little or no acoustic knowledge to determine the scientific arguments for the IoA relating to wind shear. At the same time DECC mandated this method being under the impression that it is the result of the best available science as recommended by the IoA.

34 There can be very few planning decision makers who would claim fully to understand the implications of the IoA Bulletin Method; a most cleverly conceived methodology based around standardised 10m height wind speeds that allows the wind industry to get away with even higher noise levels and makes compliance testing virtually impossible, ([Moroney, April 2012](#)).

35 Continuing with the December 2014 IoA statement, under the heading 'IOA Good Practice Guide' it states: *"It had been the working group's intention to provide a full rebuttal of information that was submitted that was not judged to represent 'good practice'. However, the working group considered that the various consultation responses had already been presented to a number of public inquiries where rebuttal evidence and inspectors reports from these inquiries already addressed all the points raised and that this information was already in the public domain"*. Once again the implication of this statement is that the IoA is content to allow the Planning Inspectorate to determine complex scientific arguments relating to acoustics. This has enabled the IoA to publish its recommendations without reference to counter arguments or scientific advice from other disciplines such as meteorology and data analysis.

36 Many of these Good Practice Guide consultation responses and their scientific arguments came from highly qualified individuals and were simply ignored as the arguments would have been inconvenient to the wind industry agenda.

37 Most of the complainants at this point simply gave up, concluding that the IoA complaints procedure had been exhausted and the IoA NWG after some ‘clarifications’ continues with ‘business as usual’. Some of the original complainants resubmitted their complaints to the Engineering Council during early January 2015. However, as of July 2015 there has been no further response from the Engineering Council or the IoA.

## 6 DECC Study into Amplitude Modulation

38 On the 30 November 2014 it was discovered via an article in the Daily Telegraph that DECC were to commission a study into wind turbine noise AM. Although no announcement to this effect was made by DECC, on 1 December the following press release appeared on the IoA web site:

### ***“IOA WELCOMES GOVT WIND TURBINE NOISE STUDY***

*The Institute of Acoustics (IOA) welcomes the announcement that the Department of Energy and Climate Change (DECC) is to commission a study into the acoustic character of wind turbine noise known as amplitude modulation (AM) with a view to recommending how to define an appropriate threshold. The IOA had previously written to DECC informing it of the current IOA AM working group which is advancing a measurement methodology and metric to define AM, and asking DECC to commission a study to look at an appropriate threshold for AM. DECC, and not the IOA, will be commissioning the study and the IOA has offered its full cooperation with the appointed researcher to support work towards the assessment of AM. The IOA hopes that the work will lead to the production of a Government policy statement on AM, following which the IOA intends to produce an AM guidance note which, like the other IOA Good Practice Guidance notes, provides guidance on how the policies and Government guidance can be applied in practice. DECC is to launch the tendering process to select an acoustics expert to conduct to review shortly. The review will conclude in spring 2015. It will not consider other types of noise from wind turbines, which, it says, are already addressed appropriately in planning guidance.”*

39 A subsequent Freedom of Information (FoI) request resulted in the release of an exchange of letters between the President of the IoA, William Egan, ([Egan August 2014](#)) and Ed Davey MP, ([Davey November 2014](#)) then Secretary of State at DECC. The IoA letter dated 7 Aug 2014 ended with the following paragraph;

*“The incidence of AM is reported to be increasing the number of complaints from onshore wind farms, and a number of nuisance cases are understood to be currently being progressed through the courts. Without a Government steer on the matter of AM, it is likely*

## Work Package 8 – Review of IoA AM Study & Methodology

*that Judges may accept a lower threshold of acceptance than current Government support for on-shore may suggest, which could restrict the roll-out of onshore wind in the UK.”*

40 This would appear to be a clear request by the IoA to DECC to ensure that the limits and controls imposed by any future AM planning condition are sufficiently benign to ensure that the deployment of wind power can continue unabated and without hindrance by the courts in cases of noise complaints. In making this request to DECC the IoA are clearly displaying a breach of Engineering Council Codes of Conduct Para 8 and Ethical Principles Sections 1 and 3 by placing the commercial interests of the wind industry and its members ahead of protecting wind farm neighbours from the effects of noise.

41 The reply by Ed Davey MP, 16 Nov 2014 ended with the following paragraph; *“You have encouraged us to commission research on an appropriate ‘penalty scheme’ in tandem to that work. I agree that understanding of the causes, occurrence and control of AM has advanced significantly, not least as a result of the RenewableUK research published in 2013, and we have now reached the point where, although we still won’t have a way of predicting at the planning stage of AM will occur at any proposed wind farm site, it would be appropriate to provide guidance to planning authorities and developers on using a suitable planning condition to protect residential amenity against the possibility of AM. Your offer to work closely with my department on this is therefore welcome. My officials are currently in the process of putting together an Invitation to Tender for this work and will be in touch with the Chair of your working group in due course.”*

42 An invitation to tender was released by DECC on 26 March 2015 with a closing date of 21 April 2015. The aims of the DECC AM project were stated as:

- To review the evidence on the effects of and response to Amplitude Modulation (AM) in relation to wind turbines, including but not limited to the research commissioned and published by RenewableUK in December 2013;
- To work closely with the Institute of Acoustics’ AMWG, who DECC expect to recommend a preferred metric and methodology for quantifying and assessing the level of AM in a sample of wind turbine noise data;
- To review the robustness of relevant dose-response relationships, including the one developed by the University of Salford as part of the RenewableUK study, ReUK December 2013, on which the correction (or penalty) for amplitude modulation proposed as part of its template planning condition is based;
- To consider how, in a policy context, the level(s) of AM in a sample of noise data should be interpreted, in particular determining at what point it causes a significant adverse impact;
- To recommend how excessive AM might be controlled through the use of an appropriate planning condition;
- To consider the engineering/cost trade-offs of possible mitigation measures.

43 The favourable response by DECC to the IoA request and the wording of the tender document indicates a closeness between DECC and the IoA and a closed minded approach to controlling AM. Note that there is no reference to LFN or infrasound in either the IoA or DECC correspondence.

44. This closeness between DECC and the IoA became even more evident on 27 July 2015 when it was discovered that DECC had awarded the AM study contract to WSP / Parsons Brinckerhoff. It would also appear to any impartial observer that it may be more than a coincidence that Richard Perkins, the Chairman of the IoA wind turbine NWG and also a senior member of the IoA Ruling Council is also the Technical Director of the Acoustics, Noise & Vibration Team at WSP / Parsons Brinckerhoff. This DECC contract award will enable Richard Perkins to control both the DECC AM study and the IoA AM study. This conflict of interest and bias towards the wind industry must also be quite obvious to any impartial observer.

### 7 IoA AMWG Consultation

45 The IoA AMWG Terms of Reference document released 1 Aug 2014 stated that a consultation document would be released during September. This failed to materialise.

46 The revised AMWG Terms of Reference document released 21 Oct 2014 stated that the consultation document would be released during February 2015. Then, allowing for a 6 week consultation period, the final report would be ready for approval by the IoA during May 2015. This also failed to materialise although the previously scheduled AM workshop was held on 27 November 2014. The workshop titled 'Methodologies for Assessing Amplitude Modulation in Wind Farm Noise' was held despite the delay in the consultation document release.

47 The main points arising from the workshop were:

- In the opinion of the INWG members present, the presentations were not scientifically informative;
- It was confirmed that the consultation document would be released during February 2015;
- Jeremy Bass of RES repeated his claims regarding the Den Brook AM condition being useless due to false positives. These claims have been strongly rebutted by MAS as being highly misleading and technically incorrect;
- It would appear the main objective of holding the workshop was for the IoA to 'tick the box' to show that they had consulted with interested parties.

48 The IoA finally released their consultation documents on 23 April 2015 (Irvine April 2015) but also stated that the AMWG report would be further delayed. The accompanying press release stated:

#### ***“LAUNCH OF AMPLITUDE MODULATION DISCUSSION***

*The IOA has published today a discussion document on methods for rating amplitude modulation (AM) in wind turbine noise. The document proposes a definition of AM for wind turbine noise and describes a literature review of the available methods. From this, three methods are proposed for discussion. These describe: a time-domain method; a frequency-*

## Work Package 8 – Review of IoA AM Study & Methodology

*domain method and a hybrid method. Software will be made available shortly to allow those interested to rate samples of AM using these methods. The aim of the discussion document, prepared by the Institute's AM working party, is obtain feedback on the preferred methods. After the consultation period, which ends on 30 June, the working group will set out its preferred method, which it plans to publish this autumn. A separate, Government-funded study is due to consider the subjective response and propose a penalty mechanism or threshold to be used when setting limits for wind turbine developments."*

Additionally, the IoA announced a second workshop that took place on 11 June 2015 and during the consultation period that ended 30 June 2015.

49 Comments on, and criticism of, the IoA consultation document include:

- The definition of EAM is too narrow as there are also many variable sound characteristics other than simply modulation depth that contribute to what is generally considered as EAM. Turbine sound emissions also include low frequency sound both audible and non-audible that should not be ignored as it all contributes to the sensation effect;
- Consideration of LFN is conspicuously absent from the consultation document. By excluding frequency data below 100Hz, much of the low frequency energy will be eliminated resulting in EAM being under reported;
- Turbine sound and EAM should be measured where people will experience it. This should include close to buildings where reflections can affect the noise levels and inside buildings where room resonance effects combined with low background noise can amplify its effects;
- Class 1 instrumentation as recommended by the IoA NWG in their Good Practice Guide have been shown to be inadequate in that its 'noise floor' is too high for low background noise environments and is unsuitable for the low frequency measurement capability required for wind turbine sound;
- The IoA and wind industry appear obsessed with 'automating' the AM measurement process using software. This will have the effect of removing transparency from the process when what is required is a simple transparent process that a local authority EHO can carry out with or without an acoustics consultant;
- The IoA AM study is too narrowly defined and avoids looking at the big picture with regard to AM and how it affects people. This IoA AM study is also widely seen as another wind industry attempt at obfuscation to ensure EAM planning conditions will not unduly constrain wind power development and has nothing to do with protecting those affected by the noise.

## 8 Conclusion

50 This chronology of the activities by the IoA shows that its NWG and specialist subgroup the AMWG devoted to the study of excess amplitude modulation have consistently operated for the benefit of the onshore wind industry in the UK and to the detriment of local communities hosting wind turbines. This is also arguably against both the IoA code of ethics and that of the Engineering Council. The effect has been to both obfuscate and hide problems related to wind turbine noise assessment from government and from the Planning Inspectorate. Whether or not this behaviour is carried forward into the future remains to be seen (July 2015).

## 9 Bibliography

Bowdler, Dick (July 2005) *ETSU-R-97 Why it is wrong*

BS4142: 1997 *Method for rating industrial noise affecting mixed residential and industrial areas*

Cox, R. (January 2014) *A critique of the Renewable UK report on wind turbine noise amplitude modulation – what it tells and what it doesn't.*

Cox, R., Unwin, D. and T Sherman (July 2012) *Wind turbine noise impact assessment, where ETSU is silent*

Cox, R., Unwin, D., Bingham, D and R Greenough (March 2013) *The bad science behind wind turbine noise guidelines*

Cox, R (March 2014) *A critique of the RenewableUK report on wind turbine amplitude modulation – what it tells and what it doesn't*

Davey E (November 2014) *Letter to the Institute of Acoustics from Secretary of State, DECC*

Egan W (August 2014) *Letter to Ed Davey, Secretary of State DECC from the Institute of Acoustics*

IoA (December 2014) *Institute of acoustics statement in respect of wind farm noise assessment*

Irvine G (April 2015) *Discussion document, methods for rating amplitude modulation in wind turbine noise & IoA Consultation questionnaire for methods for rating amplitude modulation in wind turbine noise*

Large, S and M. Stigwood, (November 2014)- *The noise characteristic of 'compliant' wind farms that adversely affect its neighbours*

## Work Package 8 – Review of IoA AM Study & Methodology

Moroney, L (April 2012) *A critique of the IoA treatment of background noise for wind farm noise assessment*

Moroney L. and J. Constable (March 2014) *The Efficacy of the Renewables UK (RUK) Condition in Controlling Wind Farm Amplitude Modulation*

Northern Ireland Assemble (January 2015) *Report on the Committee's Inquiry into Wind Energy* , NIA 226/11-16, 7 volumes.

Perkins R (August 2014) *IoA AM NWG options and terms of reference*

Perkins R (October 2014) *IoA AM NWG terms of reference & IoA AM NWG scope of work*

ReUk (December 2013) *Wind turbine amplitude modulation: Research to improve understanding as to its cause and effect*

Stigwood, M ( March 2014) *The Cotton Farm research project long term study – initial findings and other MAS research*