Multiple Defects in Bango wind farm Proposal and Assessment

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for

Residents Against Jupiter wind turbines

Critical Defects in the Bango Proposal and Assessment

1. Willful failure to comply with s7(1)(c) of Schedule 2 of the EP&A regulation
2. Fundamentally invalid assessments re noise and health impacts
3. Unsubstantiated VI assessment
4. Failure to properly review wildfire risk and public safety

s7(1)(c) of Schedule 2 of the EP&A regulation

Section 7(1)(c) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, requires that the EIS ***must*** include:

> "an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure"

The revised SEARS issued by the Department in November 2015 restated this requirement from the Regulation and elaborated by noting it included the requirement for "an assessment of the environmental costs and benefits of the development *relative to alternatives"*

The EIS submitted for Bango wind farm does not conform with that legal requirement.

Feasible alternatives not analysed

Since the EIS also fails to clearly state its objectives (contrary to s7(1)(b)), we deduce they are:

> "to generate utility scale electricity from a "renewable" source"

Feasible alternatives for that objective include:

- *A wind farm located elsewhere*
- *A solar farm located elsewhere*
- *A solar farm in the Bango locality*

The EIS contains no analysis of any of these or any other feasible alternatives.

Illustration of analysis of feasible alternatives

Aspect	Wind Farms	Solar Farms
Operational noise impact	Typically substantial	Virtually nil
Construction noise impact	Dependent on terrain and population	Generally lower than wind farm
Visual impact	Usually large	Limited
Avifauna impact	Significant	Nil
Intrusion on protected land use zones	Locality dependent	Locality dependent
Flora impact	Locality dependent	Locality dependent
Native animal impact	Locality dependent	Little
Aerial firefighting impact	Significant	Nil
Construction impact on roads and safety	Typically substantial	Less (no turbines/blades/ towers etc)
Mobile phone impact	Often substantial	Nil
Broadcast reception impact	Often substantial	Nil

No analysis of consequences of not carrying out the project

S7(1)(c) requires an analysis of the consequences of not carrying out the project.

The EIS and RTS contain no such analysis, just a bald suggestion that a certain amount of renewable electricity will be lost.

DPE has elsewhere pointed out there is a large pipeline of approved and proposed renewables projects (including some by CWP) and more keep being proposed.

The blanket claim by Bango WF proponent is NOT accompanied by the analysis required under s7(1)(c) and contrary to evidence.

Federal AAT findings re wind farm noise and health

A recent Federal Administrative Appeals Tribunal (December 2017) made important findings on wind farm noise and health impacts. It found:

- It is established that some wind farms create noise *annoyance* for members of the community and that there is a well established pathway from *annoyance* to adverse health outcomes.
- *Annoyance* from wind farm emissions is common in Australia ***and*** overseas.
- A significant proportion of wind farm noise is in the low frequency range.
- Humans are more sensitive to low frequency sound, and it can therefore cause greater *annoyance* than higher frequency sound.
- Even if it is not audible, low frequency noise and infrasound may have other effects on the human body, which are not mediated by hearing but also not fully understood.
- Noise measurement using dB(A) is an ***inadequate*** measure of relevant wind farm noise; and wind farm noise measurement should not average noise over time and frequencies.
- Wind farm low frequency noise can be greater indoors than outdoors at a dwelling.
- There is as yet no properly established “dose-response” curve which applies to wind farm noise which can be used by policy makers to set appropriate limits on wind farm sound emissions.

DPE health and noise impact assessment invalidated

NSW wind farm noise guidelines have multiple important elements which the Tribunal findings invalidate:

- Sound measurement and standards are stated in terms of dB(A);
- Sound measurement is an average value over some period (10 minutes), and then effectively averaged over multiple periods;
- Sound measurement is done external to dwellings;
- For wind farm assessment, sound values are calculated;
- For most properties, wind farm compliance noise results are calculated rather than actually measured;
- “Acceptable” levels have been set based not on dose-response data for wind farms but on dose-response data for quite different noise sources (e.g. traffic noise) – which were developed with noise measures inappropriate for wind farms.

The Bango noise assessments have been prepared under the DPE guidelines which the findings invalidate.

Proposed consent conditions are based on the same invalidated methodology and standards.

Tribunal process

- Senior Federal Court judge plus another Deputy President of AAT
- Evidence over 12 days, focused on wind farm noise and health
- Eight expert witnesses, including medical and acoustics
- Testimony from people affected by wind farm and other industrial noise
- Two counsel who subjected expert witnesses to rigorous questioning
- Considered an extensive range of publications, including NHMRC Systematic Review and much more

A degree of rigour in considering wind farm noise and health outcomes which DPE guidelines process does not match nor IPC likely to.

Noise Assessment Implications

- DPE noise guidelines have not been revised in light of Tribunal findings
- DPE does not seem to have advised IPC of these finding and their potential implications for appropriate measurement of wind farm noise and appropriate consent conditions
- IPC not bound by AAT findings but ignoring the conclusions of that rigorous process would deny procedural fairness to residents potentially affected by Bango wind farm

Due process requires IPC to reject proposal until relevant guidelines have been independently reviewed in light of AAT findings and Bango reassessed on that basis.

Real world wind farm noise experience

The following objections were recently lodged with DPE about White Rock wind farm Stage 1

- *"my wife and family live app 3kilometres east from the existing white rock wind farm now in operation. we are now enduring periods of noise at night that make it very difficult to sleep. We were told very little noise would be produced but that is not the case"*
- *"We now find that stage 1 of the wind farm is 5 kilometers away and we hear the noise at night and in the early morning. "*

This is from turbines substantially shorter and less powerful than proposed for Bango WF.

Defects in VI assessment process

- Noise assessment process relies on standardised, calibrated physical instruments for measurement and monitoring
- VI assessment process treats assessors as the measuring instruments
- They are non standardised and uncalibrated
- Research shows they are unreliable and often biased
- If IPC is to make VI assessments itself, or rely on advice from other persons, it must have evidence that those making the VI assessment actually have the specific personal expertise necessary for the very distinct task of assessing wind farm VI

Evidence from DPE and PAC indicates that none of those involved in this case have demonstrated evidence of such expertise

GIPA requests to DPE and PAC re relevant expertise

GIPA requests were lodged with DPE and PAC, seeking for a number of individuals, records held showing they:

1. had undertaken any formal courses in order to learn how to accurately assess the visual impact specifically of wind farms or similar infrastructure;
2. had been tested for their ability to make accurate assessments of the visual impact of wind farms or similar infrastructure, and their score on those tests;
3. had been tested for the degree to which their assessments of the visual impact of wind farms or similar infrastructure are consistent with the visual impact judgements made by residents to the impact and their consistency scores.

GIPA results

DPE reported in July 2017 it had no such records on the nominated individuals and PAC reported similarly in October 2017. The individuals included:

- Mike Young and David Kitto (DPE signatories to Bango Assessment)
- Andrew Homewood (apparent VI consultant for Bango WF and sometime advisor to DPE)
- Terry O'Hanlon (DPE independent VI reviewer for Bango WF)
- John Hann (Bango IPC chair)

The GIPA results indicate that, at the time of reporting, DPE/PAC had no documented evidence of the ability of those individuals to make accurate assessment of wind farm VI.

Unless IPC has subsequently received such records, it cannot assume validity in VI assessments by any of those individuals or their advice about VI consent conditions.

Failure to properly review wildfire risk and public safety

- NSW RFS advice indicates existence of wind farms causes a change in aerial firefighting to protect air crew
- However, NSW RFS appears to have not conducted a specific evaluation of the public safety consequences in the Bango locality (unless different for Bango than Jupiter WF)
- DPE appears to have obtained no explicit advice from NSW RFS about public safety consequences of Bango WF
- Yet DPE, which lacks expertise in the area, claims there will be no adverse impact on public safety.

Could be seen as reckless indifference to public safety, conveniently blurred between two government agencies.

Critical problems with multiple aspects of proposal and assessment

1. Willful failure to comply with s7(1)(c) of Schedule 2 of the EP&A regulation
2. Fundamentally invalid assessments re noise and health impacts
3. Unsubstantiated VI assessment
4. Failure to properly review wildfire risk and public safety

Proposal needs to be rejected until all corrected

Administrative Appeals Tribunal

DECISION AND REASONS FOR DECISION

Division	**TAXATION & COMMERCIAL DIVISION**
File Number	**2015/4289**
Re	**Waubra Foundation**
	APPLICANT
And	**Commissioner of Australian Charities and Not-for-profits Commission**
	RESPONDENT

DECISION

Tribunal	**The Honourable Justice White, Deputy President** **Deputy President K Bean**
Date	**4 December 2017**
Place	**Adelaide**

The decision under review is affirmed.

[redacted]

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The Honourable Justice White

CATCHWORDS

CHARITIES – Revocation of registration as a charity – Whether Tribunal should determine what was the correct or preferable decision when the Assistant Commissioner made his decision or whether Tribunal should determine the correct or preferable decision as at the time of its own decision – Whether applicant is an institution whose principal activity is to promote the prevention or the control of diseases in human beings – Whether there is evidence that wind farm emissions cause or are associated with diseases – Whether there is a plausible basis for thinking that wind farm emissions could lead to disease – Whether applicant is an entity which has a purpose of promoting or protecting human rights – Whether applicant has a purpose of promoting or protecting the Right to Health – Decision under review affirmed.

LEGISLATION

Australian Charities and Not-for-profits Commission Act 2012 (Cth), ss 25-5, 30-10, 30-20, 35-5, 35-10, 35-15, 35-20, 155-5, 160-5, 160-15, 160-25, 165-40, 190-10, 300-5; divs 25, 30, 165
Australian Charities and Not-for-profits Commission (Consequential and Transitional) Act 2012 (Cth), sch 1, pt 1, cl 7; sch 2, pt 1, cl 3
Charities Act 2013, ss 5, 12
Charities (Consequential Amendments and Transitional Provisions) Act 2013 (Cth)
Human Rights (Parliamentary Scrutiny) Act 2011 (Cth), s 3
Income Tax Assessment Act 1997, ss 30-20, 30-125, 995-1; sub-div 30-B, Item 1.1.6
Taxation Administration Act 1953 (Cth), ss 14ZZK, 426-55, sch 1
Administrative Decisions (Judicial Review) Act 1977 (Cth), s 5
Administrative Appeals Tribunal Act 1975, ss 33(1)(c), 43(1)
Income Tax Assessment Act 1915 (Cth), s 18(h)
Taxation Laws Amendment Act (No 2) 2001 (Cth)
Evidence Act 1995 (Cth), ss 76-79

CASES

Federal Commissioner of Taxation v Dalco (1990) 168 CLR 614
Shi v Migration Agents Registration Authority [2008] HCA 31; (2008) 235 CLR 286

Drake v Minister for Immigration and Ethnic Affairs (1979) 46 FLR 409

Re Control Investment Pty Ltd and Australian Broadcasting Tribunal (No 2) (1981) 3 ALD 88

Freeman v Secretary, Department of Social Security (1988) 19 FCR 342

Commissioner of Taxation v Cancer and Bowel Research Association Inc (as trustee for the Cancer and Bowel Research Trust) [2013] FCAFC 140; (2013) 305 ALR 534

Fletcher v Commissioner of Taxation (1988) 19 FCR 442

Concut Pty Ltd v Worrell [2000] HCA 64; (2000) 176 ALR 693

Stratton v Simpson (1970) 125 CLR 138

Vancouver Society of Immigrant and Visible Minority Women v Minister for National Revenue [1999] 1 SCR 10

Chesterman v The Federal Commissioner of Taxation (1923) 32 CLR 362

Chesterman v The Federal Commissioner of Taxation (1925) 37 CLR 317

The Commissioners for Special Purposes of the Income Tax v Pemsel [1891] AC 531

Perpetual Trustee Company Ltd v The Federal Commissioner of Taxation (1931) 45 CLR 224

Victorian Women Lawyers' Association v Federal Commissioner of Taxation [2008] FCA 983; (2008) 170 FCR 318

Commissioner of Taxation v Word Investments Ltd [2008] HCA 55; (2008) 236 CLR 204

Royal Choral Society v Commissioners of Inland Revenue [1943] 2 All ER 101

Brookton Co-operative Society Limited v Federal Commissioner of Taxation (1981) 147 CLR 441

Maunsell v Olins [1975] AC 373

Collector of Customs v Agfa-Gevaert Ltd (1996) 186 CLR 389

Healthy Cities Illawarra Inc and Commissioner of Taxation [2006] AATA 552; 63 ATR 1165

Law Institute of Victoria v Commissioner of State Revenue [2015] VSC 604

Comcare v Mooi (1996) 69 FCR 439

Prain v Comcare [2017] FCAFC 143

Rodriguez v Telstra Corporation Ltd [2002] FCA 30

Metroll Victoria Pty Ltd v Wyndham CC [2007] VCAT 748

R v Bonython (1984) 38 SASR 45

HEARING DATES

5-8, 12-16, 19, 21 and 22 September 2016

SECONDARY MATERIALS

Explanatory Memorandum – Taxation Laws Amendment Bill (No 2) 2001

Pearce, DC and Geddes, RS *Statutory Interpretation in Australia* (LexisNexis Butterworths, 8th ed, 2014)

Macquarie Dictionary, 6th ed., 2015 Macmillan Publishers Group Australia

Committee on Economic Social and Cultural Rights, General Comment No 14: The Right to the Highest Attainable Standard of Health (Art.12), 22nd sess, UN Doc E/C.12/2000/4

REASONS FOR DECISION

The Honourable Justice White
Deputy President K Bean

4 December 2017

INTRODUCTION

1. Under the *Australian Charities and Not-for-profits Commission Act 2012* (Cth) (the ACNC Act), entities may be registered as a charity of a specified subtype or of specified subtypes if they satisfy certain criteria. In some cases, the subtype in which a charity is registered determines whether donations to the charity are deductible for tax purposes from the assessable income of the donors.

2. In circumstances to be explained shortly, the applicant was, until December 2014, registered as a charity under four of the subtypes listed in s 25-5 of the ACNC Act, namely, as an:

    Item 1 Entity with a purpose to which paragraph (a) of the definition of charitable purpose in subsection 12(1) of the *Charities Act 2013* applies (advancing health);

    Item 7 Entity with a purpose to which paragraph (g) of the definition of charitable purpose in subsection 12(1) of the *Charities Act 2013* applies (promoting or protecting human rights);

    Item 12 Entity with a purpose to which paragraph (1) of the definition of charitable purpose in subsection 12(1) of the *Charities Act 2013* applies (advancing public debate); and

    Item 13 Institution whose principal activity is to promote the prevention or the control of diseases in human beings.

3. On 11 December 2014, an Assistant Commissioner of the Australian Charities and Not-for-profits Commission (the ACNC) determined that the applicant's registration as a charity of subtypes 7 and 13 should be revoked. The Assistant Commissioner also determined that an alternative claim by the applicant to be registered as a charity with the purpose of advancing education should not be accepted. The effect of these determinations was that the applicant remained registered as a charity in two subtypes only, namely, advancing health and advancing public debate (Items 1 and 12).

4. Subsequently, by a decision made on 23 June 2015 (wrongly shown as 23 June 2014), the respondent, the Commissioner of the ACNC (the Commissioner), disallowed an objection by the applicant to those aspects of the Assistant Commissioner's decision which concerned the revocation of its registration as a charity in subtypes 7 and 13 (the Objection Decision). The applicant had not objected to the Assistant Commissioner's decision with respect to the subtype of advancing education.

5. In these proceedings, the applicant seeks review of the Commissioner's Objection Decision. In our opinion, the application fails and the Objection Decision should be affirmed. Our reasons follow.

THE APPLICANT

6. The applicant was established in March 2010. It is said to have been established initially as an association but, at the times material to these proceedings, it has been a company limited by guarantee.[1] It is a not-for-profit entity.[2]

7. At least in the past, a significant focus of the applicant's activities has been on the adverse health effects which it attributes to wind turbines in wind farms.

8. The applicant's objects, as stated in its Constitution, have changed significantly since 2011. At the time of the Objection Decision, the statement of the applicant's objects was: "To promote human health and wellbeing through the prevention and control of diseases and other adverse health effects due to industrial sound and vibration".

9. This was the statement in the applicant's constitution from 24 January 2015 until 26 April 2016. On that date, the statement of the applicant's objects changed to include an additional object: "To promote and protect human rights where those human rights are, or may be, adversely affected because of industrial sound and vibration".

10. Both the applicant and the Commissioner attached some significance to the changes in the applicant's statement of objects since its establishment in 2010 and it will be necessary to return to that history. It will also be necessary to consider whether it is open to the Tribunal to have regard to all aspects of that history.

HISTORY OF THE APPLICANT'S REGISTRATION

11. With effect from 1 October 2010 (that is, shortly after its establishment), the applicant was endorsed by the Commissioner of Taxation as a "deductible gift recipient" (DGR) under Item 1.1.6 of Sub-div 30-B of the *Income Tax Assessment Act 1997* (Cth) (the ITA Act) on

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1 Exhibit A4, T-documents, T3/122, at [20].

2 Statement of Agreed Facts (SOAF), at [1]-[3].

the basis that it was "a charitable institution whose principal activity is to promote the prevention or the control of diseases in human beings". The Tax Commissioner's endorsement had the effect of making donations to the applicant tax deductible gifts. The evidence before the Tribunal did not indicate the basis upon which the Commissioner of Taxation had issued the endorsement.

12. The ACNC Act came into operation on 3 December 2012. It established the ACNC, established the office of the Commissioner, provided for the registration by the ACNC of not-for-profit entities satisfying certain criteria, and provided in several respects for their regulation and monitoring. The ACNC Act provided in s 25-5(5) for seven subtypes of charities.

13. By the operation of the *Australian Charities and Not-for-profits Commission (Consequential and Transitional) Act 2012* (Cth) (the ACNC Transitional Act) and by virtue of its previous endorsement by the Commissioner of Taxation, the applicant was, on the commencement of the ACNC Act, taken to be registered as a charity of two subtypes under s 25-5(5) of the ACNC Act, namely:

> Item 4 Entity with another purpose that is beneficial to the community; and
>
> Item 5 Institution whose principal activity is to promote the prevention or the control of diseases in human beings.

14. On 1 January 2014, the *Charities Act 2013* (Cth) (the Charities Act) came into operation. Section 5 contains definitions of "charitable" and "charity" as follows:

> **Definition of charity**
>
> In any Act:
>
> **charitable**: an entity is **charitable** if the entity is a charity.
>
> Example: A reference in an Act to a charitable trust is a reference to a trust that is a charity.
>
> **charity** means an entity:
>
> (a) that is a not-for-profit entity; and
>
> (b) all of the purposes of which are:
>
> (i) charitable purposes (see Part 3) that are for the public benefit (see Division 2 of this Part); or
>
> (ii) purposes that are incidental or ancillary to, and in furtherance or in aid of, purposes of the entity covered by subparagraph (i); and
>
> …
>
> (c) none of the purposes of which are disqualifying purposes (see Division 3); and

(d) that is not an individual, a political party or a government entity.

15. Section 12 of the Charities Act defines the term "charitable purpose" appearing in the definition of "charity" and indicates that there may be 12 different types of charitable purpose:

> **Definition of charitable purpose**
>
> (1) In any Act:
>
> **charitable purpose** means any of the following:
>
> (a) the purpose of advancing health;
>
> (b) the purpose of advancing education;
>
> (c) the purpose of advancing social or public welfare;
>
> (d) the purpose of advancing religion;
>
> (e) the purpose of advancing culture;
>
> (f) the purpose of promoting reconciliation, mutual respect and tolerance between groups of individuals that are in Australia;
>
> (g) the purpose of promoting or protecting human rights;
>
> (h) the purpose of advancing the security or safety of Australia or the Australian public;
>
> (i) the purpose of preventing or relieving the suffering of animals;
>
> (j) the purpose of advancing the natural environment;
>
> (k) any other purpose beneficial to the general public that may reasonably be regarded as analogous to, or within the spirit of, any of the purposes mentioned in paragraphs (a) to (j);
>
> …
>
> (l) the purpose of promoting or opposing a change to any matter established by law, policy or practice in the Commonwealth, a State, a Territory or another country, if:
>
> (i) in the case of promoting a change—the change is in furtherance or in aid of one or more of the purposes mentioned in paragraphs (a) to (k); or
>
> (ii) in the case of opposing a change—the change is in opposition to, or in hindrance of, one or more of the purposes mentioned in those paragraphs.
>
> (2) Paragraph (l) of the definition of **charitable purpose** in subsection (1) is the only paragraph of that definition that can apply to the purpose of promoting or opposing a change to any matter established by law, policy or practice in the Commonwealth, a State, a Territory or another country.
>
> (3) For the purposes of this section, it does not matter whether a purpose is directed to something in Australia or overseas.

16. Certain provisions of the *Charities (Consequential Amendments and Transitional Provisions) Act 2013* (Cth) (the Charities Transitional Act) also came into operation on

1 January 2014. Amongst other things, sch 1, pt 1, cl 7 of that Act repealed s 25-5(5) of the ACNC Act and replaced it with a new s 25-5(5). The new s 25-5(5) provided for 14 (instead of the previous seven) subtypes of charities.

17. Schedule 2, pt 2, clauses 2 and 3 of the Charities Transitional Act provided for two kinds of transition, one in relation to "old subtypes" which were "equivalent" to subtypes in the new s 25-5(5), and one in relation to "old subtypes" which were "possibly equivalent" to subtypes in the new s 25-5(5).

18. The applicant's registration under the old subtype 5 was equivalent to the new subtype 13, as each was expressed in identical terms, namely, "[i]nstitution whose principal activity is to promote the prevention or the control of diseases in human beings".

19. The transitional position with respect to registration under the old subtype 4 was a little more complex. Schedule 2, pt 2, cl 3(3) contemplated that an entity previously registered as subtype 4 in the old s 25-5(5) may be "possibly equivalent" to 10 different subtypes in the new s 25-5(5). Clause 3(1) allowed an entity which had been registered as a subtype 4 charity to notify the Commissioner that it met the description of one or more of these 10 subtypes and, in the event that it gave such a notification, provided that the Commissioner was to treat the entity as registered under the nominated subtype or subtypes.

20. By a letter dated 18 February 2014, the applicant notified the ACNC that it considered itself entitled to be registered under four of the subtypes in the new s 25-5(5), namely, Items 1, 2, 7 and 12.[3] The inclusion of Item 2 was misconceived as it was not one of the subtypes which the transitional provisions recognised as being "possibly equivalent" to subtype 4.

21. Accordingly, by virtue of the transitional provisions and its notice of 18 February 2014, the applicant became registered with effect from 1 January 2014 as a charity of the following subtypes:

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[3] Exhibit A4, T20.

Item 1 Entity with a purpose to which paragraph (a) of the definition of charitable purpose in subsection 12(1) of the Charities Act 2013 applies (advancing health);

Item 7 Entity with a purpose to which paragraph (g) of the definition of charitable purpose in subsection 12(1) of the Charities Act 2013 applies (promoting or protecting human rights);

Item 12 Entity with a purpose to which paragraph (l) of the definition of charitable purpose in subsection 12(1) of the Charities Act 2013 applies (advancing public debate); and

Item 13 Institution whose principal activity is to promote the prevention or the control of diseases in human beings.

22. The applicant's registration as an Item 13 subtype charity (sometimes referred to as a "health promotion charity") was important to it because it meant that it then satisfied the definition of "registered health promotion charity" in s 995-1 of the ITA Act. Section 30-20 of the ITA Act has the effect that donations to a registered health promotion charity are tax deductible in the hands of the donor.

23. The applicant's registration as a charity in the subtype "protection of human rights" did not have any effect on the tax deductibility of donations, but did mean that the applicant was entitled to certain tax concessions.

THE REQUIREMENTS FOR REGISTRATION

24. The entitlement of an entity to registration as a charity is contained in s 25-5 of the ACNC Act. Section 25-5 provides (relevantly):

> (1) An entity is entitled to registration as a type of entity if:
>
> (a) it meets the conditions in subsection (3); and
>
> (b) it meets the description of that type of entity in column 1 of the table in subsection (5); and
>
> (c) if the entity has previously been a registered entity, but its registration as a type of entity has been revoked—the Commissioner is satisfied that the matters which led to the revocation have been dealt with such that the registration of the entity would not conflict with the objects of this Act.
>
> Note: Registration of an entity mentioned in paragraph (c) has effect from the time of registration (see section 30-30). It does not rescind the revocation of the previous registration.
>
> (2) An entity is entitled to registration as a subtype of entity if:
>
> (a) it meets the conditions in subsection (3); and
>
> (b) it meets the description of that subtype of entity in column 2 of the table in subsection (5); and

(c) it is entitled to registration as the type of entity that corresponds to that subtype of entity (as set out in that table); and

(d) it is registered as that type of entity.

(3) The conditions are as follows:

(a) the entity is a not-for-profit entity;

(b) the entity is in compliance with the governance standards and external conduct standards (see Part 3-1);

(c) the entity has an ABN;

(d) the entity is not covered by a decision in writing made by an Australian government agency (including a judicial officer) under an Australian law that provides for entities to be characterised on the basis of them engaging in, or supporting, terrorist or other criminal activities.

(4) To avoid doubt, an entity may be entitled to registration as more than one subtype of entity.

Note: An entity could be registered as an entity with a purpose of advancing social or public welfare, and also be registered as a public benevolent institution.

25. Division 30 of the ACNC Act provides for the process of registration of an entity, both as a type and as a subtype of entity. The process commences with an application to the Commissioner, using an approved form (s 30-10). Subject to some matters which are presently immaterial, the Commissioner is obliged to register an applicant which is entitled to registration under div 25 (s 30-20).

26. It was common ground that the applicant satisfied the criteria contained in s 25-5(1) and (3). The issue in the ACNC was whether the applicant satisfied s 25-5(2)(b), namely, that it met the description of the subtypes of entities in the table in subs (5) which it claimed, in particular, whether its purposes included the purpose of promoting or protecting human rights and whether its principal activity was to promote the prevention or the control of diseases in human beings.

REVOCATION OF REGISTRATION

27. Section 35-10 of the ACNC Act is the source of the Commissioner's power to revoke the registration of a charity. The power may be exercised with respect to both the type and subtype of registration (s 35-5). Section 35-10 provides:

35-10 Revoking registration

(1) The Commissioner may revoke the registration of a registered entity if the Commissioner reasonably believes that any of the following conditions are met:

(a) at any time after the date of effect of the registration, the entity is or was not entitled to registration;

(b) the registered entity provided, in connection with its application for registration, information that was false or misleading in a material particular;

(c) at any time after the date of effect of the registration:

(i) the registered entity has contravened a provision of this Act, or it is more likely than not that the registered entity will contravene a provision of this Act; or

(ii) the registered entity has not complied with a governance standard or external conduct standard, or it is more likely than not that the registered entity will not comply with such a standard;

(d) the registered entity has:

(i) a trustee in bankruptcy; or

(ii) a liquidator; or

(iii) a person appointed, or authorised, under an Australian law to manage the affairs of the entity because it is unable to pay all its debts as and when they become due and payable;

(e) the registered entity has made a request to the Commissioner, in the approved form, that the Commissioner revoke the registration.

(2) In deciding whether to revoke the registration of an entity the Commissioner must take account of the following matters:

(a) the nature, significance and persistence of any contravention of this Act or non-compliance with a governance standard or external conduct standard (or any such contravention or non-compliance that is more likely than not) by the registered entity;

(b) what action the Commissioner, the registered entity, or any of the responsible entities of the registered entity, could take or have taken:

(i) to address any such contravention or non-compliance (or prevent any such contravention or non-compliance that is more likely than not); or

(ii) to prevent any similar contravention or non-compliance;

(c) the desirability of ensuring that contributions (see section 205-40) to the registered entity are applied consistently with the not-for-profit nature, and the purpose, of the registered entity;

(d) the objects of any Commonwealth laws that refer to registration under this Act;

(e) the extent (if any) to which the registered entity is conducting its affairs in a way that may cause harm to, or jeopardise, the public trust and confidence in the not-for-profit sector mentioned in subsection 15-5(1) (Objects of this Act);

(f) the welfare of members of the community (if any) that receive direct benefits from the registered entity;

(g) any other matter that the Commissioner considers relevant.

(3) The revocation must specify the day on which the entity's registration is taken to be revoked. The specified day must be:

(a) if the reason for the revocation is that the entity is not entitled to registration:

(i) the day on which the entity first ceased to be entitled; or

(ii) a later day; or

(b) if the reason for the revocation is that the entity provided, in connection with its application for registration, information that was false or misleading in a material particular:

(i) the day on which the registration took effect; or

(ii) a later day; or

(c) otherwise:

(i) the day on which the revocation is made; or

(ii) a later day.

(4) …

28. As can be seen, the discretion of the Commissioner to revoke the registration of an entity is enlivened upon the Commissioner forming a reasonable belief of one or more of five matters, being disentitlement to registration (sub-s (1)(a)), the entity's provision of false or misleading information (sub-s (1)(b)), relevant contraventions (sub-s (1)(c)), insolvency (sub-s (1)(d)), or a request by the entity (sub-s (1)(e)). By s 35-10(3), the Commissioner must in the revocation specify the day on which the entity's registration is taken to be revoked. In two cases (lack of entitlement to registration and the provision of false or misleading information), the date on which the revocations takes effect may be a date antecedent to the date of the revocation decision.

29. We note these matters concerning the power of revocation in s 35-10. First, the exercise of the power is contingent on the Commissioner forming a reasonable belief that at least one of the defined circumstances exists. Secondly, the exercise of the power is discretionary. The Commissioner is not compelled to revoke the registration of an entity upon forming the belief.

30. Thirdly, the power vested in the Commissioner is one of revocation of registration. It is not a power to suspend the registration or to allow it to continue subject to compliance with specified conditions. There is no indication that the Commissioner may revoke the registration for a specified period. Once an entity's registration has been revoked, that entity may become re-registered only by going through the process set out in div 30 of the ACNC Act. This is confirmed by s 25-5(1)(c), including the note to that subparagraph.

31. The fourth matter concerns s 35-10(1)(a), being the provision relied upon by the Assistant Commissioner and the Commissioner in the applicant's case. That subparagraph empowers the Commissioner to revoke the registration of an entity if the Commissioner believes, reasonably, that the entity is not (at the time of the Commissioner's

consideration) entitled to registration or was not, at any time after the date of effect of the registration, entitled to that registration. That is to say, the Commissioner may revoke a registration even if a disentitling factor which existed in the past is no longer operative. No doubt, the Commissioner may consider whether the discretion should be exercised in favour of revocation if the disentitling factor existed for a short time only, but it seems that the discretion is enlivened by a lack of entitlement to registration which existed at some time in the past (but after the date of effect of the registration) even if the entity has again become entitled to registration.

THE DECISION OF THE ASSISTANT COMMISSIONER

32. As just noted, s 35-10 of the ACNC Act empowers the Commissioner to revoke the registration of a registered entity if the Commissioner reasonably believes, amongst other things, that at any time after the date of effect of the registration, the entity is not, or was not, entitled to registration. Subject to a qualification which is presently immaterial, the Commissioner must, before revoking a registration, give a show cause notice to the registered entity (s 35-15).

33. The ACNC gave the applicant show cause notices with respect to its registration in subtypes 7 and 13.[4] The task of determining whether or not the applicant's registration in those subtypes should be revoked was carried out by the ACNC Assistant Commissioner, pursuant to a delegated power.

34. In his decision of 11 December 2014, the Assistant Commissioner accepted that the applicant met the requirements of the ACNC Act for registration as a charity in two subtypes under s 25-5 of the ACNC Act, namely, advancing health and advancing public debate (Items 1 and 12).[5] He directed that the ACNC Register be amended to show that the applicant was registered for each of these subtypes of charity with effect from 1 January 2014.

35. However, the Assistant Commissioner considered that the applicant had not, as at 1 January 2014 or at any time since, met the eligibility requirements for registration as a

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4 Exhibit A4, T18 and T117.

5 Exhibit A4, T3/116.

charity of the subtype of protecting human rights (Item 7).[6] Given that the applicant had never satisfied those requirements, he revoked that registration with effect from 1 January 2014, being the date upon which the applicant had, pursuant to the transitional provisions, first been registered in that subtype.

36. Further, the Assistant Commissioner considered that the applicant's principal activity was not the promotion or prevention of the control of diseases in human beings (Item 13). He concluded at [16] that "to date there has been no rigorous independent scientific evidence that finds that the ill-health complained of is caused by the physiological effects from wind turbines [or] that there are human diseases called "wind turbine syndrome" or "vibroacoustic disease"". The Assistant Commissioner considered that the applicant had not satisfied the eligibility requirements for this subtype at any time since its initial registration in the subtype. However, having regard to the tax consequences for the applicant and third parties, he decided not to make the revocation of registration retrospective. Accordingly, the Assistant Commissioner revoked the applicant's registration as a charity of that subtype with effect from the date of his decision, namely, 11 December 2014.

37. The revocation of the applicant's registration in Item 13 had two immediate effects. First, donations to the applicant were no longer tax deductible. Secondly, the applicant became obliged by cl 21.1(h) of its Constitution to transfer the balance of its Gift Fund to another institution with rights of a defined kind. Clause 21.1(h) is a clause of the kind required by s 30-125 of the ITA Act as a condition of an entity's endorsement as a deductible gift recipient.

38. As already noted, the applicant had by its letter to the ACNC of 18 February 2014 also sought to be registered in the subtype "advancing education", but the Charities Transitional Act did not have effect of deeming it to have that registration. The Assistant Commissioner treated the applicant's notice in this respect as a request to be registered in the subtype "advancing education". He rejected that application. The applicant did not object to that decision and it was not the subject of the application to this Tribunal. It is not necessary to mention it further.

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[6] Exhibit A4, T3, at [152]-[153] and [218].

THE OBJECTION DECISION

39. The applicant exercised its right pursuant to s 35-20 of the ACNC Act and objected to the revocation of its registration in subtypes 7 (protecting human rights) and 13 (health promotion charity). It did so by a letter of "appeal" dated 9 February 2015.

40. Section 160-15 of the ACNC Act required the Commissioner to decide whether to allow the objection, wholly or in part, or to disallow it. On 23 June 2015, the Commissioner disallowed the applicant's objection (the Objection Decision).[7]

41. In relation to the applicant's claim to be a health promotion charity, the Commissioner concluded that the applicant's activities were primarily information sharing and advocacy relating to concerns about infrasound, low frequency noise and vibration from wind farms, and the possible effects which these may have on human health.[8] Although the Commissioner accepted that the applicant is also interested in other sources of emissions of a similar kind, she considered that these were not the focus of the applicant's activities.[9] The Commissioner then concluded that the weight of scientific evidence did not support the existence of diseases or adverse health effects caused by emissions from wind farms or other sources of infrasound, low frequency noise or vibration. That being so, the Commissioner concluded that the applicant could not be regarded as an entity whose principal activity is to promote the prevention or the control of diseases in human beings.[10]

THE PRESENT APPLICATION FOR REVIEW

42. Section 160-25 of the ACNC Act provides (relevantly) that an entity dissatisfied with an objection decision by the Commissioner may apply to this Tribunal for review of the objection decision. The applicant's present application is an exercise of this right.

43. Division 165 of the ACNC Act modifies the operation of the *Administrative Appeals Tribunal Act 1975* (the AAT Act) in a number of respects.

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7 Exhibit A4, T5.

8 Exhibit A4, T3, at [59].

9 Ibid.

10 Ibid, at [92], [108], [176], [299] and [355].

44. Amongst other things, s 165-15 has the effect that an application to this Tribunal should set out a "statement of the reasons for the application". The applicant attached a statement in purported compliance with this requirement. However, it was, with respect to the applicant, misconceived as the statement set out grounds for review derived from s 5 of the *Administrative Decisions (Judicial Review) Act 1977* (Cth). The jurisdiction to hear and determine applications under the ADJR Act is not vested in this Tribunal. Counsel for the applicant recognised that this was so and did not rely on the stated grounds. Instead, at the direction of the Tribunal, each party filed a Statement of Facts, Issues and Contentions (SFIC).

45. Section 165-40 of the ACNC Act controls the matters which an applicant may agitate on an application for review and, in addition, provides for the applicant to have the burden of proof:

> **165-40 Grounds of objection and burden of proof**
>
> On an application for review of an objection decision:
>
> (a) the applicant is, unless the Administrative Appeals Tribunal orders otherwise, limited to the grounds stated in the objection to which the objection decision relates; and
>
> (b) the applicant has the burden of proving that the administrative decision concerned should not have been made or should have been made differently.

46. As can be seen, absent an order to the contrary by the Tribunal, an applicant is, on a review of the present kind, limited to "the grounds stated in the objection to which the objection decision relates" and has the burden of proving that the "administrative decision" should not have been made or should have been made differently. The standard of proof is the ordinary civil standard. By virtue of ss 155-5 and 300-5 of the ACNC Act, the "administrative decision" is the decision which is the subject of the objection, in this case, the decision of the Assistant Commissioner.

47. As s 165-40 is in almost identical terms to s 14ZZK(1) of the *Taxation Administration Act 1953* (Cth), assistance can be derived from the authorities which have considered the effect of that provision. Amongst these is the decision of the High Court in *Federal Commissioner of Taxation v Dalco* (1990) 168 CLR 614, in which Brennan J observed at 621:

> It would be inappropriate for a court determining an appeal to make an order altering the tax liability assessed (s. 199) unless the court were satisfied that the amount to which it proposed to alter the assessment represented the true tax liability of the taxpayer. Although the grounds of objection limit the grounds of appeal, the ultimate question for the

> court hearing the appeal is not whether the grounds have been made out but whether the amount assessed as taxable income is wrong. The burden which rests on a taxpayer is to prove that the assessment is excessive and that burden is not necessarily discharged by showing an error by the Commissioner in forming a judgment as to the amount of the assessment**.**

48. Similarly here, in our view it will not necessarily be sufficient for the applicant to show that one or more of the grounds relied upon has been made out. We must affirm the decision under review unless we are satisfied, by reference to the considerations made relevant by the ACNC Act, and the material before us, that that decision should not have been made, or should have been made differently.

49. Ordinarily, one would expect the identification of grounds of objection to be straightforward. An entity which wishes to object to the revocation of its registration is required to make the objection *"*in the approved form" and must state in that form "fully and in detail, the grounds on which the entity relies".[11] The Commissioner has, in the exercise of the power vested by s 190-10 of the ACNC Act, approved a form for the making of objections pursuant to s 160-5.

50. However, the applicant did not use the approved form. Instead, it sent a letter to the Commissioner on 9 February 2015, attaching a document setting out the basis for an "appeal" against the decision of the Assistant Commissioner. The 31 page attachment did not identify separately the grounds of the objection. Instead, the attachment was an amalgam of grounds, submissions and evidence. The Commissioner noted that the applicant's "appeal" was not in the approved form but, given that the applicant's intention to object to the Assistant Commissioner's decision was clear, determined to treat the 9 February 2015 letter and the attachment as a notice of objection.

51. The Commissioner extracted eight headings in the attachment appearing under the heading "Comments on Mr Locke's Reasons for Decision" on pages 2-13 of the notice of objection and treated those headings and one additional matter as the grounds of objection. This is apparent from [35]-[36] of the Commissioner's reasons:

> [35] The Applicant makes "Comments on Mr Locke's Reasons for Decision" in pages 2-13 of the Notice of Objection. The headings set out in those comments are as follows:

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[11] The ACNC Act, s 160-5.

(1) Restricted focus on wind turbine noise research evidence only;

(2) Environmental sleep disorder excluded from considerations;

(3) Deliberate exclusion of mental health disorders;

(4) "No evidence" of physiological effects from wind turbines;

(5) "No rigorous independent scientific evidence" of "Vibroacoustic Disease";

(6) "No rigorous independent scientific evidence" of "Wind Turbine Syndrome";

(7) New research supporting Pierpont's original hypothesis about the role of Infrasound;

(8) Acceptance by Other Medical Practitioners of Wind Turbine Syndrome.

[36] These eight headings, together with the general comments made regarding human rights will be treated as the nine grounds of objection for the purpose of this objection decision.

Later, at [300]-[350], the Commissioner addressed each of these grounds.

52. Given the terms of s 165-40 of the ACNC Act and the importance of the stated grounds of objection to the Tribunal's task on the review, we reviewed for ourselves the applicant's letter of 9 February 2015 and the attachment. We distilled the grounds of objection contained in those documents in a way which differs in some respects from those stated by the Commissioner. Subject to two alterations, the parties agreed on the Tribunal's distillation of the grounds. Accordingly, the hearing proceeded on the basis that the grounds to which s 165-40 refers are as follows:

(a) The applicant's activities are not confined to the effects of sound and vibration produced by wind turbines (pages 2-3);

(b) An extensive body of research relating to the health impacts and diseases in humans caused by other sources of noise had been ignored (pages 3 and 5);

(c) The applicant's concern with "environmental sleep disorder" which was, at the time of the decision, specifically included as Objective 8 of the applicant's Constitution is accepted by the World Health Organisation and the American Academy of Sleep Medicine as a "disease" and that these facts were ignored (page 5);

(d) The consideration of the effects of sound and vibration had been confined, inappropriately, to physiological effects, and so had not taken account of the evidence of effects on mental health (pages 7-8);

(e) The conclusion that there is "no rigorous independent scientific evidence" of physiological effects from:

(i) wind turbines;

(ii) vibroacoustic disease;

(iii) wind turbine syndrome;

is, in each case, incorrect (pages 8-13);

(f) The Assistant Commissioner should not have relied on some of the studies and literature to which he referred, either at all or without qualification (pages 14-21), and he ignored other relevant studies (page 16);

(g) The conclusion that the applicant did not have the purpose of promoting or protecting human rights was wrong because the infliction of disease on neighbours by industrial operations whether by the noise or by other means:

(i) contravenes Article 7 of the International Covenant on Civil and Political Rights (ICCPR);

(ii) if done with the acquiescence of public officials, contravenes Article 16 of the Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Publishment (the CAT) and may also contravene Articles 1 and 2 of the CAT (pages 21-22).

(h) The conclusion that the applicant did not have the purpose of promoting or protecting human rights was wrong because it ignored the established human right to enjoy the highest attainable standard of physical and mental health and the requirement for proper regulation and enforcement of noise pollution policy to protect, maintain and promote that right as provided by:

(i) Article 12 of the International Covenant on Economic, Social and Cultural Rights (the ICESCR); and

(ii) Article 24 of the Convention of the Rights of the Child (the CROC) (page 1 footnote 5).

53. Ground (a) raised an issue concerning the nature and reach of the applicant's activities. Essentially, it involves a question of fact. Grounds (b) to (f) raised in diverse ways issues of the relationship between exposure to noise and vibration, on the one hand, and adverse impacts on human health, on the other, but with particular reference to the noise and vibration said to be produced by wind turbines. They concerned the correctness of the conclusion of the Assistant Commissioner on that issue.

54. Grounds (g) and (h) related to the applicant's claim to be entitled to registration as an Item 7 charity, namely, promoting or protecting human rights. In his final submissions, counsel for the applicant said that the applicant no longer pursued Ground (g). Accordingly, it need not be considered further.

55. None of the grounds identified any matter listed in s 35-10(2) of the ACNC Act as requiring particular consideration on the review. We have nevertheless had regard to those matters in addressing the matters raised by the parties.

THE MATERIAL TIME FOR CONSIDERATION

56. As already noted, the decision which is the subject of the review by the Tribunal is the Objection Decision, that is, the decision by the Commissioner disallowing the applicant's

objection to the revocation decision of the Assistant Commissioner. That is the effect of s 160-25 of the ACNC Act. It is also indicated by the numerous references to the "Objection Decision" in div 165 of the ACNC Act.

57. However, s 165-40 makes it apparent that the Tribunal is to review the Objection Decision by considering whether the Assistant Commissioner's decision to revoke the applicant's registration in Items 7 and 13 "should not have been made, or should have been made differently". That task is to an extent confined as, absent an order from the Tribunal to the contrary, the applicant is limited to the grounds of objection to the decision of the Assistant Commissioner which it raised in the objection.

58. This raises an issue as to the time at which the Tribunal is to assess the claimed entitlement of the applicant to registration in Items 7 and 13. Is it the period in the past in respect of which the applicant was found not to be entitled to registration; the time of this Tribunal's decision; the time of the Objection Decision (23 June 2015); the time of the Assistant Commissioner's decision (11 December 2014); or, in the case of the revocation of the applicant's registration as an Item 7 charity, the date on which the revocation took effect (1 January 2014)?

59. Until relatively late in the proceedings, both parties contended that the Tribunal should make the determination by reference to the state of affairs existing as at the time of its own decision. They submitted that this was the effect of s 43 of the AAT Act, s 35-10 of the ACNC Act, and of the decision in *Shi v Migration Agents Registration Authority* [2008] HCA 31; (2008) 235 CLR 286. The parties advanced this contention in a joint submission made on 15 January 2016 addressing the material time for the Tribunal's review, in their respective opening submissions, in their respective outlines of closing submissions and, initially, in their respective oral closing submissions. However, part way through the oral closing submissions, the parties changed their positions. Both then contended that the material time for the Tribunal to consider the matter was at 11 December 2014, being the date of the decision of the Assistant Commissioner.

60. We consider the parties' ultimate position to be correct, although we would prefer to say that the Tribunal is to consider the facts and circumstances bearing on the applicant's entitlement to registration in the period up to 11 December 2014, taking into account that the Assistant Commissioner's finding was that the applicant had not been entitled, as at

1 January 2014, to registration in either Item. It is appropriate to indicate our reasons for that conclusion.

61. Section 43(1) of the AAT Act provides:

> **Tribunal's decision on review**
>
> (1) For the purpose of reviewing a decision, the Tribunal may exercise all the powers and discretions that are conferred by any relevant enactment on the person who made the decision and shall make a decision in writing:
>
> (a) affirming the decision under review;
>
> (b) varying the decision under review; or
>
> (c) setting aside the decision under review and:
>
> (i) making a decision in substitution for the decision so set aside; or
>
> (ii) remitting the matter for reconsideration in accordance with any directions or recommendations of the Tribunal.

62. Thus, the Tribunal is empowered "to exercise all the powers and discretions" conferred on the decision-maker by a relevant enactment and has wide powers with respect to the implementation of its decision. The statement of Bowen CJ and Deane J in *Drake v Minister for Immigration and Ethnic Affairs* (1979) 46 FLR 409 at 419 as to the task of the Tribunal has been influential and often cited:

> The question for the determination of the Tribunal is not whether the decision which the decision-maker made was the correct or preferable one on the material before him. The question for the determination of the Tribunal is whether that decision was the correct or preferable one on **the material before the Tribunal**. (emphasis added)

Thus, ordinarily the task of the Tribunal on an application for review is to consider the matter *de novo* having regard to the facts and circumstances bearing on the subject matter of the review at the time of the Tribunal's consideration.

63. Although s 165-5 of the ACNC Act modifies the application of s 43 in the review of objection decisions in some respects, it does not, in terms, modify the application of s 43(1).

64. However, the position indicated by s 43(1) and stated in *Drake* is subject to any indication to the contrary in the enactment providing for review of a decision by the Tribunal or which arises inherently from the nature of the decision being reviewed or its subject matter.

65. In *Shi*, the High Court considered whether the Tribunal was limited, on a review of a decision of the Migration Agents Registration Authority (MARA) to cancel the registration

of a migration agent on the grounds contained in s 303 of the *Migration Act 1958* (Cth), to the facts and circumstances existing at the time of MARA's decision. Subject to one qualification, all members of the Court considered that the Tribunal was to consider the state of affairs concerning the migration agent which existed at the time of its own decision and not those which existed at the time of MARA's decision. However, all members of the Court emphasised the importance of close attention to the enabling legislation when determining questions of this kind (Kirby J at [25], Hayne and Heydon JJ at [92] and Kiefel J at [119], [133]).

66. Hayne and Heydon JJ referred to ss 25 and 43 of the AAT Act and to s 303 of the Migration Act. Their Honours noted at [96] that the questions for the Tribunal reviewing the cancellation decision were "first, whether *the Tribunal* was satisfied that either of the s 303(1) grounds said to be engaged … was made out, and secondly, whether *the Tribunal* should exercise the powers given by s 303(1) to cancel or suspend the appellant's registration or to caution him".[12] At [101], Hayne and Heydon JJ concluded that there was nothing in the Migration Act which fixed a particular time as the point at which a migration agent's fitness to provide immigration assistance was to be assessed and that s 303 contained no temporal element.

67. Kirby J considered that four features of the legislative scheme indicated that it was the facts and circumstances existing at the time of the Tribunal's decision which were to be considered: the nature of the Tribunal; the function of the Tribunal; the purpose of s 43; and the nature of the decision under review. In relation to the last of these matters, Kirby J considered it was pertinent that the circumstances bearing on each of the grounds for cancellation contained in s 303 could be supervening events, that is, events occurring between MARA's decision and that of the Tribunal, at [48]. This indicated the appropriateness of the Tribunal considering the position as at the time of its own decision. His Honour endorsed the statement of Davies J in *Re Control Investment Pty Ltd and Australian Broadcasting Tribunal (No 2)* (1981) 3 ALD 88 at 92-93 that it is for the Tribunal to reach its own decision upon the relevant material including any new, fresh, additional or different material that had been received by the Tribunal as relevant to its decision, at [37]. Kirby J accepted that there may be instances in which it will be inherent in the nature of a

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[12] *Shi v Migration Agents Registration Authority* [2008] HCA 31; (2008) 235 CLR 286 [96] (emphasis in the original).

particular decision that review of the decision is confined to identified past events, at [44], but did not consider that the circumstances in *Shi* provided such a case.

68. Kiefel J (with whom Crennan J agreed on this issue) noted that the task of the Tribunal was to reach its own conclusion as to the correct decision by conducting an independent assessment and determination of the matters necessary to be addressed and that its exercise of power was not dependent upon the existence of error in the original decision, at [141]. Her Honour concluded:

> In considering what is the right decision, the Tribunal must address the same question as the original decision-maker was required to address. Identifying the question raised by the statute for decision will usually determine the facts which may be taken into account in connection with the decision. The issue is then one of relevance, determined by reference to the elements in the question, or questions, necessary to be addressed in reaching a decision. It is not to be confused with the Tribunal's general procedural powers to obtain evidence. The issue is whether evidence, so obtained, may be taken into account with respect to the specific decision which is the subject of review.
>
> Where the decision to be made contains no temporal element, evidence of matters occurring after the original decision may be taken into account by the Tribunal in the process of informing itself. Cases which state that the Tribunal is not limited to the evidence before the original decision-maker, or available to that person, are to be understood in this light. It is otherwise where the review to be conducted by the Tribunal is limited to deciding the question by reference to a particular point in time.[13]

69. Kiefel J distinguished between the grounds which could warrant the cancellation of the agent's registration. Her Honour considered that, insofar as MARA had relied on the agent's non-compliance with the relevant code of conduct, there was a temporal limitation, being the time at which the non-compliance had occurred. In relation to that matter, her Honour found the Tribunal was restricted to a consideration of events to that point of time, at [146]. However, the position was different with respect to the separate question of whether the agent was "a person of integrity" or not "a fit and proper person" to be a migration agent. Kiefel J considered that that ground did not contain any temporal limitation, at [149].

70. In our opinion, the decision in *Shi* indicates two matters which are particularly relevant presently. The first is the necessity to have close regard to the terms of the enabling legislation. The second is that the presence of a temporal limitation in the subject matter of the decision under review may have the effect that the Tribunal is to carry out its review

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[13] *Shi*, at [142]-[143] (citations omitted).

by reference to the circumstances at an antecedent time. This being so, we do not regard the decision in *Shi* as being decisive of the identification of the time to be considered in the present case. Close regard must instead be had to provisions in the ACNC Act and to the bases upon which the revocation of the applicant's registrations is said to be warranted.

71. Section 35-10 is pertinent in this respect. As we have already observed, s 35-10(1)(a) enlivens the Commissioner's discretion to revoke registration if the Commissioner reasonably believes that, *at some time in the past*, (but after the date of initial registration) an entity had not been entitled to registration or is not, at the time of the Commissioner's consideration, entitled to that registration. The former of these alternatives has an inherent temporal limitation.

72. As previously noted, the Assistant Commissioner considered that the applicant had not been entitled to registration as an Item 7 or Item 13 charity at any time after 1 January 2014 until his decision on 11 December 2014. He formed that belief by reference to the facts and circumstances existing during that period.

73. In our view, this consideration is sufficient by itself to indicate that the circumstances of this case are different from those considered in *Shi*.

74. There are other bases upon which *Shi* should, in our view, be distinguished. The mechanisms for review considered in *Shi* did not include the intermediate step of a process of objection of the kind for which the ACNC Act provides. It was the decision of the primary decision-maker which was the subject of review by the Tribunal in that case.

75. Perhaps more importantly, the provisions for review considered in *Shi* did not include a counterpart to s 165-40 of the ACNC Act. As already noted, s 165-40(b) imposes a burden of proof on an applicant. That burden is to prove that the administrative decision should not have been made or should have been made differently. It is not, we observe, an onus of proving that the applicant is entitled (presently) to registration or that the Objection Decision was wrongly made. Instead, an applicant has an onus of establishing error in the original decision. That requirement suggests naturally that regard is to be had to the facts and circumstances existing at least by the time that that decision was made. It is not readily to be expected that the Tribunal is to consider whether or not the decision

should not have been made by reference to facts and circumstances which have come into existence only since the making of the decision and which could not have had any bearing on the impugned decision.

76. Subparagraph (a) in s 165-40 limits (absent an order otherwise) the matters to which the Tribunal may have regard to the grounds of objections stated in the objection to which the Objection Decision relates. That limitation indicates that the focus is to be on the complaints which the applicant made about the administrative decision. In our opinion, the confinement of an applicant in that way does not sit comfortably with the notion that the Tribunal is to consider the position by reference to the facts and circumstances existing at the time of its own decision. Instead, an applicant must show error in the original decision by reference to the grounds of complaint upon which it previously relied. It is to be expected that these grounds will be anchored in the facts and circumstances existing by the time of the original decision.

77. Section 165-40 is relevant in another way. It indicates that the task of the Tribunal on the present review differs from that discussed in *Drake* and in *Shi* and, in particular, that the Tribunal is not considering the matter *de novo*, as counsel for the Commissioner contended in the written outline of closing submissions. Instead of the Tribunal reviewing the administrative decision on its merits and determining whether the decision of the decision-maker is the correct or preferable decision on the material before it, it is to consider whether the applicant has proved, having regard only to defined grounds, that the decision should not have been made or should have been made differently. In our opinion, this makes it inappropriate to apply, uncritically, the reasoning in *Shi* and in *Drake* in the present case.

78. The circumstances of the present case are analogous to those considered by Davies J in *Freeman v Secretary, Department of Social Security* (1988) 19 FCR 342. Those circumstances were summarised by Kiefel J in *Shi* at [144]. A widow who had been receiving the widows' pension commenced a de facto relationship, a circumstance which disentitled her to continuance of the pension. The statutory scheme was such that a pension, once cancelled on this ground, could be reinstated only on a further claim being made. Davies J concluded that, in that circumstance, the Tribunal had to limit its consideration to the circumstances existing at the time when the decision to cancel the pension was made when determining whether that was the correct or preferable decision.

It was not for the Tribunal to determine whether the widow's entitlement had resumed following the cessation of the de facto relationship.

79. It remains to consider two further decisions. The first is *Commissioner of Taxation v Cancer and Bowel Research Association Inc (as trustee for the Cancer and Bowel Research Trust)* [2013] FCAFC 140; (2013) 305 ALR 534. That decision concerned, relevantly, the revocation by the Commissioner of Taxation of a trustee's endorsement as a health promotion charity and therefore as a deductible gift recipient. The relevant power of revocation was contained in s 426-55 of Sch 1 of the *Taxation Administration Act 1953* (Cth) (the TA Act) which provided (relevantly):

> (1) The Commissioner may revoke the endorsement of an entity if:
>
> (a) the entity is not entitled to be endorsed; or
>
> …
>
> (2) The revocation has effect from a day specified by the Commissioner (which may be a day before the Commissioner decided to revoke the endorsement).

80. This was the counterpart in the ITA Act to s 35-10 of the ACNC Act. It applied until the ACNC Act was enacted and came into operation.

81. The question in *Cancer and Bowel Research* was whether the Tribunal was to review the revocation of registration of the Trust as at the date of the decision of the Commissioner of Taxation, or as at the earlier date at which the revocation of registration was to take effect. This Tribunal had concluded that the power of revocation depended upon an adverse finding as to the Trust's entitlement to endorsement as at the date upon which the Commissioner made the decision to revoke. The Full Court of the Federal Court held that this approach was correct.

82. There was no express consideration by the Full Court in *Cancer and Bowel Research* of whether it was the facts and circumstances existing as at the date of the Tribunal's decision which were to be considered. It seems to have been assumed that that date was not the relevant date so that the only contest was between the two earlier dates. We note that the Full Court did not refer to *Shi* but, having regard to the presence of Edmonds J in the Coram (His Honour also having been a member of the Full Court of the Federal Court in *Shi*), doubt that it was overlooked.

83. We regard the Full Court decision in *Cancer and Bowel Research* as being consistent with the approach which we consider appropriate in the present case.

84. The second case is one to which counsel for the Commissioner referred the Tribunal. This was *Fletcher v Commissioner of Taxation* (1988) 19 FCR 442. In that case, the Full Court of the Federal Court held that this Tribunal was entitled, on review of the Commissioner of Taxation's disallowance of objections, to exercise the discretions vested in the Commissioner even though the Commissioner had not himself exercised the discretions. As we understood the submission, it was to the effect that the decision in *Fletcher* indicated that the Tribunal is not confined to the material which was before the Assistant Commissioner or only to events which had occurred up to the time of his decision.[14] Counsel submitted that his was particularly so, given that s 14ZZK of the TA Act is, materially, in the same terms as s 165-40.

85. There are at least two reasons why we consider that this submission should not be accepted. First, s 14ZZK was not inserted into the TA Act until 1991, well after *Fletcher* had been decided. The counterpart to s 14ZZK in the *Income Tax Assessment Act 1936* (Cth), s 190, was expressed in terms which are, in material respects, different from s 165-40. Secondly, the statutory power, the exercise of which gave rise to the review in *Fletcher*, was s 177F of the ITA Act, a provision in very different terms to s 35-10 of the ACNC Act. We also note the Full Court's emphasis, at 452, on the necessity "to examine closely the relevant statutory provisions".

86. We have concluded therefore that the Tribunal should carry out the review by reference to the facts and circumstances existing up to the time of the decision of the Assistant Commissioner, namely, 11 December 2014, but noting that his determination was that the applicant had not been entitled to registration in either subtype as at 1 January 2014.

87. We add that a finding by the Tribunal that the applicant does, presently, satisfy the eligibility requirements for registration in Item 7 or Item 13 would not avail it, at least while the conclusion that it was not entitled to registration in the period between 1 January and 11 December 2014 still stands. That is because the Tribunal is not empowered to give effect to such a conclusion. It is not for the Tribunal to consider whether the applicant is

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[14] Commissioner's Outline of Closing Submissions, at [3].

entitled to a fresh registration. If the applicant's circumstances have changed since those warranting deregistration, this is a matter to be addressed on an application by the applicant pursuant to div 30 of the ACNC Act for registration.

88. The conclusion that the Tribunal is to carry out its review by reference to the facts and circumstances pertaining at an antecedent time does not mean that the Tribunal is confined to considering only that evidence which was in existence at that time. Evidence which is subsequently ascertained is capable in some circumstances of being rationally probative of the true state of affairs at an antecedent time, even though the existence of the evidence was not then known by the decision-maker. The entitlement of a party to a contract to rely upon a subsequently ascertained breach by the other to justify termination of the contract provides an illustration in another context: *Concut Pty Ltd v Worrell* [2000] HCA 64; (2000) 176 ALR 693. Accordingly, we accept that it will be appropriate for the Tribunal to have regard to some of the evidence which has come into existence only since 11 December 2014 for this limited purpose.

89. It is also possible that to the extent that s 35-10 of the ACNC Act involves the exercise of a residual discretion, the Tribunal may have to consider matters occurring since 11 December 2014. However, it was not suggested that the residual discretion should be exercised in favour of the applicant in this case.

90. Against this background, the principal issues for the Tribunal's determination can be stated as:

(a) what was the principal activity of the applicant in the period between 3 December 2012 (when the applicant obtained registration under the ACNC Act on its commencement) and 14 December 2014;

(b) was that principal activity to promote the prevention or control of diseases in human beings?

(c) did the applicant before 14 December 2014 have as a purpose the promoting or protecting of human rights?

91. We note that this formulation of the issues is different from that for which the applicant contended in relation to Item 13,[15] namely, whether there is a disease or diseases to which the applicant's activities are directed and whether the applicant's principal activity is to promote the prevention or control of that disease or diseases.

ITEM 13: HEALTH PROMOTION CHARITY – GENERAL

92. It is convenient at the outset to consider the terms of Item 13 in s 25-5(5) of the ACNC Act. As already noted, Item 13 provides for a subtype of charity in the following terms: "[i]nstitution whose principal activity is to promote the prevention or the control of diseases in human beings". In our view, this description of the subtype is to be understood as a composite, but it is convenient to note some of its separate elements.

Institution

93. First, Item 13 identifies the kind of charitable body to which it refers by the word "institution". This contrasts with the noun "entity" used in the description of subtypes 1-12. In context, an institution seems to be a particular type of entity: see *Stratton v Simpson* (1970) 125 CLR 138. Given the circumstances of the applicant to which we will refer shortly, there is scope for doubt that it is an "institution" in the requisite sense. However, the Commissioner accepted, as an agreed fact, that the applicant is an institution of that kind. We will therefore proceed on that basis.

Activity and purpose

94. Secondly, Item 13 refers to the principal "activity" of the institution. This contrasts with Items 1-12, each of which refers to the entity's "purpose". This difference in terminology suggests, *prima facie*, that the focus in Item 13 is on the actual activities of the entity, rather than its purpose. Nevertheless, we consider that the purpose of the entity's activities remains an important consideration. That is indicated by the terminology used to identify the necessary character of the entity's principal "activity", that is, the infinitive phrase "to promote the prevention or the control of diseases in human beings". An activity to promote a consequence seems necessarily to incorporate an element of the purpose to which the activity is directed. It connotes something more than the effect of the activity,

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[15] Transcript, 21 September 2016, p 734 lines 7-11.

although if that effect is the natural and probable consequence of the activity, it may constitute material from which the purpose of the activity can be inferred. It also connotes a requirement for there to be a rational or plausible link between the activity, on the one hand, and the prevention or control of a disease, on the other.

95. Item 13 is not to be read as though it refers to an institution whose "principal activity is the prevention or the control of diseases in human beings". If that expression had been used, it would be more natural to understand that the focus of the enquiry would concern the relationship between the institution's identified activity or activities, on the one hand, and the *effect* on the prevention or control of diseases on the other. However, as we have said, the use of the infinitive phrase "to promote" suggests that the focus is instead on the *purpose* of the institution's identified principal activity.

96. Iacobucci J referred to a distinction of this kind in *Vancouver Society of Immigrant and Visible Minority Women v Minister of National Revenue* [1999] 1 SCR 10 at [152] when discussing the term "charitable activities":

> [I]t is really the purpose in furtherance of which an activity is carried out, and not the character of the activity itself, that determines whether or not it is of a charitable nature. Accordingly, this Court held … that the inquiry must focus not only on the activities of an organization but also on its purposes.

97. This understanding of Item 13 is supported by reference to the legislative history to which counsel for the Commissioner drew attention. Section 18(h) of the *Income Tax Assessment Act 1915* (Cth) allowed taxpayers a deduction against assessable income for gifts "to public charitable institutions". In *Chesterman v The Federal Commissioner of Taxation* (1923) 32 CLR 362, the High Court held that the term "charitable purposes" in s 8(5) of the *Estate Duty Assessment Act 1914-1916* (Cth) was used in its popular sense, that is, broadly the relief of those in "necessitous circumstances". On appeal, the Privy Council overturned this decision and held that the term "charitable purposes" was used in its technical legal sense and was not restricted to the relief of poverty: *Chesterman v The Federal Commissioner of Taxation* (1925) 37 CLR 317. That had been the meaning given to the term "charitable purposes" in *The Commissioners for Special Purposes of the Income Tax v Pemsel* [1891] AC 531.

98. Shortly afterwards, the Parliament amended both ss 8(5) and 18(h)[16] so as to confine the exemption from tax and duty to gifts to, relevantly, "a public benevolent institution" and to funds established for the purpose of providing relief to those in necessitous circumstances. In *Perpetual Trustee Company Ltd v The Federal Commissioner of Taxation* (1931) 45 CLR 224, the High Court held that the term "public benevolent institution" meant an institution organised for the relief of poverty, sickness, destitution or helplessness.

99. Apart from amendments which are not presently material, there things stood until 2001 when tax concessions in respect of "a charitable institution whose principal activity is to promote the prevention or control of diseases in human beings" were introduced: *Taxation Laws Amendment Act (No 2) 2001* (Cth). This amendment (the 2001 Amendment) inserted the Item 1.1.6 to which reference was made earlier in these reasons into s 30-20(1) of the ITA Act.

100. The Minister's Explanatory Memorandum for the amending bill indicated that its purpose was "to extend the taxation treatment currently given to public benevolent institutions (PBIs) to certain charitable institutions", being those "whose principal activity is promoting the prevention or control of disease in human beings", at [5.1]-[5.2]. The Explanatory Memorandum went on to indicate that the Government recognised that the activities of some PBIs had changed with the consequence that they had ceased to be eligible for the tax concessions:

> [5.3] The Treasurer announced … that the Government would ensure that organisations whose main activity is promoting the prevention or control of disease in humans would continue to access the tax benefits available to PBIs. These charitable institutions may have been PBIs in the past but, over time, their activities have changed such that they may no longer be PBIs and therefore, no longer eligible for taxation concessions such as exemption from FBT and sales tax.

Later, the Explanatory Memorandum noted that, generally, a PBI has as "its main or principal object" the relief of poverty, sickness, suffering, distress, misfortune, destitution or helplessness.

101. In relation to DGR status, the Explanatory Memorandum stated:

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[16] The Estate Duty Assessment Act was amended in 1928 and the Income Tax Assessment Act in 1927.

> [5.20] The charitable institutions to be covered by this amendment are medical or health organisations whose principal activity is preventative in nature, *rather than providing direct relief of sickness or suffering*. These organisations typically focus on particular types of ailments or health issues, for example, asthma, cancer, AIDS, arthritis, heart conditions, brain conditions, paraplegia and kidney conditions. (Emphasis added)

102. As earlier noted, the terms of Item 1.1.6 in s 30-20(1) of the IT Act have been replicated in Item 13 of s 25-5(5) of the ACNC Act. In our view, this legislative history is important. First, it tends to confirm that Item 13 contains a purposive element. Secondly, it indicates that health promotion charities are those which, while promoting the prevention or control of diseases, are not themselves engaged in the treatment and alleviation of sickness and suffering. As will be seen shortly, this is significant in the resolution of the applicant's claimed entitlement to registration as an Item 13 charity.

103. Item 13 contemplates that an institution may have more than one activity. So also may an institution have more than one purpose. The adjective "principal" indicates that registration as an Item 13 charity is to be determined by reference to the entity's main or predominant activity. This requires identification of the entity's principal activity amongst all its activities and then the determination of whether that activity is to promote the prevention or control of diseases in human beings. We accept, however, that the one activity can have two or more aspects to it.

104. The identification of an institution's principal activity is very much a question of fact, to be determined having regard to all the evidence bearing upon the nature of its activities and their purposes. In an analogous context, French J said in *Victorian Women Lawyers' Association v Federal Commissioner of Taxation* [2008] FCA 983; (2008) 170 FCR 318 at [146] that the assessment is to be made "holistically".

105. The institution's own description of its activities and purposes, whether in its constitution or elsewhere, will be relevant but not conclusive. Thus, in *Commissioner of Taxation v Word Investments Ltd* [2008] HCA 55; (2008) 236 CLR 204, the plurality said at [17]:

> [I]t is necessary to examine the objects, **and the purported effectuation of those objects in the activities**, of the institution in question. In examining the objects, it is necessary to see whether its main or predominant or dominant objects, as distinct from its concomitant or incidental or ancillary objects, are charitable. (emphasis added and citation omitted)

Although in dissent, Kirby J made a similar observation at [174], "in my opinion, the real discrimen for the characterisation of an entity propounded as a "charitable institution" is what that entity *actually* does and what purposes it actually pursues" (emphasis added).

106. In this respect, the warning of Lord Greene MR in *Royal Choral Society v Commissioners of Inland Revenue* [1943] 2 All ER 101 at 106 is pertinent: "[i]t may very well be that a purpose which, on the face of it looks to be the real purpose, on close examination, is found not to be the real purpose".

107. We keep in mind that in this area of the law, as in so many other areas, purpose is not to be equated with motive. The reasons of an institution for engaging in an activity may be revelatory of its purpose but are not themselves conclusive of that purpose: see, *Brookton Co-operative Society Limited v Federal Commissioner of Taxation* (1981) 147 CLR 441 at 466-7.

108. We also note the guidance contained in the Commissioner's Interpretation Statement as follows:

> The principal activity is the main activity conducted by the charity, or the activity that it conducts more than any other activity. While most often it will take the majority of the charity's time or resources, there may be cases where it does not. An HPC can undertake other activities, but promoting the prevention or control of disease(s) in human beings must be its *main* activity. For example, if a charity had five activities, four of which each took 15% of its time and resources, and a fifth which took up 40% of its time and resources, it is the fifth which would be considered its "principal activity".[17]

Disease

109. The term "disease" is not defined in the ACNC Act. The Macquarie Dictionary gives the following (relevant) definition of the word disease "morbid condition of the body, or of some organ or part; illness, sickness; ailment … any deranged or depraved condition, as of the mind, affairs etc."

110. Although the applicant referred its experts to various definitions, its ultimate position was that the Tribunal should apply the definition of "disease" in s 34-20 of the ITA Act, namely:

> (3) **Disease** includes any mental or physical ailment, disorder, defect or morbid condition, whether of sudden onset or gradual development and whether of genetic or other origin.

[17] Exhibit A4, T292/6202; Australian Charities and Not-for-profits Commission, "Commissioner's Interpretation Statement: Health Promotion Charities" (Interpretation Statement), CIS 2015/01, 5. Principal activity, at [5.2] (emphasis in original).

111. The Explanatory Memorandum for the 2001 Amendment to the ITA Act referred to this definition (then in s 995-1(1) of the ITA Act).

112. The applicant relied on the authorities to which Pearce and Geddes refer at [3.36] of "Statutory Interpretation in Australia" (LexisNexis Butterworths, 8th Edition, 2014) which indicate that when a legislature uses a term in a later statute in the same context that the term was used in an earlier statute, it may be taken, absent any contrary indication, to have intended that the word be used with the same meaning. The applicant then submitted that it is appropriate for the Tribunal to have regard to the ITA Act definition of disease.

113. The Commissioner submitted that reference to the ITA definition is inappropriate for a number of reasons. First, the only use currently of the term "disease" in the ITA Act is in div 34 of that Act which is concerned with the deductibility of expenses associated with the acquisition of occupational clothing, this being a very different context. Secondly, the Dictionary in s 300-5 of the ACNC Act defines some terms by reference to the ITA Act but not the word "disease". This supports an inference, the Commissioner submitted, that use of the ITA definition is not intended.

114. The Commissioner submitted that the term "disease" should instead be determined by reference to the medical "register", this being the most appropriate "audience or register". The Commissioner referred in this respect to the speech of Lord Simon of Glaisdale in *Maunsell v Olins* [1975] AC 373 at 391:

> Statutory language, like all language, is capable of an almost infinite gradation of "register" – ie, it will be used at the semantic level appropriate to the subject matter and to the audience addressed (the man in the street, lawyers, merchants, etc). It is the duty of a court of construction to tune in to such register and so to interpret the statutory language as to give to it the primary meaning which is appropriate in that register (unless it is clear that some other meaning must be given in order to carry out the statutory purpose or to avoid injustice, anomaly, absurdity or contradiction). In other words, statutory language must always be given presumptively the most natural and ordinary meaning which is appropriate in the circumstances.

115. The High Court referred to this passage with approval in *Collector of Customs v Agfa-Gevaert Ltd* (1996) 186 CLR 389 at 398.

116. Finally, the Commissioner referred to the decision in *Re Healthy Cities Illawarra Inc and Federal Commissioner of Taxation* [2006] AATA 522; (2006) 63 ATR 1165 in which, at

[49], Block DP said in relation to Item 1.1.6 of the ITA Act that "whether a particular condition is to be characterised as a disease will be in most cases a matter for expert medical opinion".

117. On this basis, the Commissioner urged on the Tribunal the definition proffered by Professor Wittert, a witness called by the Commissioner:

> A disease is a pathological condition of a body part, an organ, or a system resulting from various causes, such as infection, genetic defect, or environmental stress, and characterized by an identifiable group of signs or symptoms.[18]

118. We do not regard these submissions of the Commissioner as persuasive. The legislative history supports an inference that the word "diseases" in Item 13 of s 25-5(5) of the ACNC Act is used in the sense defined in the ITA Act or a sense similar to it. Section 300-5 of the ACNC Act defines only a limited number of terms in that Act by reference to the ITA Act and these are terms of a technical nature, for example, "ABN", "tax law" and "Australian law". We do not think that it can reasonably be said that s 25-5(5) is speaking to a medical audience or a medical "register". It is speaking to the public generally and in particular, to those entities in the general public who engage, or wish to engage, in charitable activities of a particular kind. Finally, we consider that the passage in *Healthy Cities* upon which the Commissioner relies is not directed to the question of statutory construction which the Tribunal is presently considering but, rather, to the evidence which would enable the Tribunal to determine whether a given condition is within the concept of disease in the statutory context.

119. In *Comcare v Mooi* (1996) 69 FCR 439 at 444-5, Drummond J discussed a number of meanings of the term "disease" in the context of the definition of that term then contained in the *Safety, Rehabilitation and Compensation Act 1988* (which was in very similar terms to that which now appears in s 34-20 of the ITA Act):

> "Disease" in ordinary usage, when used with reference to physical or mental conditions, connotes a disturbance of the normal functions. Dictionary meanings of "disease" include "a morbid condition of the body, or of some organ or part; illness; sickness; ailment" (*The Macquarie Dictionary*) and "a condition of the body, or of some part or organ of the body, in which its functions are disturbed or deranged". (*The Shorter Oxford English Dictionary*). Medical dictionaries give the following meanings of "disease":
>
> "In general, a departure from the normal state of health. More specifically, a disease is the sum total of the reactions, physical and mental, made by a person to a noxious agent

[18] Exhibit R56, at 'Response to expert witness questions for Professor Gary Wittert' 1.

> entering his body from without or arising within (such as a micro organism or a poison), an injury, a congenital or hereditary defect, a metabolic disorder, a food deficiency or a degenerative process … *Mental disease*. Any disease with predominantly mental symptomatology, whether of mental or physical causation". (*Butterworths Medical Dictionary*, 2nd ed, 1980).
>
> "Any deviation from or interruption of the normal structure or function of any part, organ, or system (or combination thereof) of the body that is manifested by a characteristic set of symptoms and signs and whose etiology, pathology and prognosis may be known or unknown … *mental disease*. Any clinically significant behavioural or psychological syndrome characterised by the presence of distressing symptoms or significant impairment of functioning. Mental disorders are assumed to result from some psychological or organic dysfunction of the individual; the concept does not include disturbances that are essentially conflicts between the individual and society (social deviance)." (*Dorland's Illustrated Medical Dictionary*, 28th ed, 1994).
>
> Only conditions involving a disturbance of the normal functions of body or mind are within the term "disease", as defined, and thus "injuries" for the purposes of s 14(1) of the Act.[19]

120. We consider it appropriate to apply these meanings in the present context, noting that they appear to be an elaboration of the definition contained in the ITA Act.

To promote the prevention or control

121. In context, the term "to promote" has the second meaning given in the Macquarie Dictionary, namely "to further the growth, development, progress etc., of; encourage".

122. In this case, it is furthering the development of the prevention and the control of diseases in human beings which is the required characteristic.

123. The meaning of the words "prevention" and "control" can vary according to the context in which they are used. We consider that the word "prevention" in Item 13 is used in the sense of "keeping from occurring, hindering" and that the word "control" is used in the sense of "holding in check, curbing" (see in each case the definitions in the Macquarie Dictionary). Subject to what we say below, we see no indication in the ACNC Act that these words are to be construed narrowly.

124. The disjunctive "or" indicates that the principal activity need not be to promote both prevention and control of diseases in human beings. In this case we do not think that the difference between the two concepts has a practical effect.

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[19] *Mooi* was considered in *Prain v Comcare* [2017] FCAFC 143 and remains good law.

125. The range of activities which may be encompassed by the *promotion* of the prevention or the control of diseases in human beings may be diverse. The ACNC has recognised that this is so in its "Interpretation Statement" concerning health promotion charities, issued in May 2015:

> Prevention or control of disease(s) includes, but is not limited to, taking action to reduce the spread of disease(s), research into management and treatment of disease(s), managing and treating disease(s) and activities to alleviate suffering or distress caused by disease(s).

126. The ACNC has also acknowledged that it may be sufficient if an institution is seeking to prevent or control adverse health effects which could result in disease:

> 'Disease' is a broad term that encompasses both physical and mental illnesses. It must be a disease, rather than a general health condition or symptom. However, where a health condition or symptom, if untreated, will degenerate into an identified disease(s), activities to prevent or control that condition or symptom could be viewed as prevention or control of the disease(s). An example could be activities working to reduce or prevent tobacco use, based on evidence that links tobacco use with a range of cancers.[20]

127. However, the Interpretation Statement also says:

> While the definition does not appear to restrict the number of diseases or groups of diseases that a charity could promote the prevention or control of, the ACNC considers that where possible there should be identification of the disease(s), whose control or prevention the charity is promoting. For example, to be an HPC it would not be sufficient for a charity to promote appropriate weight reduction or increased physical activity, without identifying the disease(s) that are being prevented or controlled through this promotion activity.[21]

128. In our view, action to further medical and public knowledge of the potential adverse effects on human health of a particular activity or exposure may be a step in the promotion of the prevention or control of those adverse effects. The promotion of an understanding of the ways in which activities or conditions may result in disease is, in our view, within the parameters of promotion of the prevention or the control of diseases. Such an understanding is usually a precursor to an understanding of the steps which can be taken to be to hinder or curb the development of those conditions. The promotion of research into the various forms of cancer and their aetiology is a well-recognised example.

129. Although the range of activities which may be encompassed by the promotion of the prevention or control of diseases in human beings may be diverse, it is not without limit. The word "promote" is important in governing the reach of Item 13. As already noted, the

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[20] Exhibit A4, T292/6202; Interpretation Statement, 6. Diseases in human beings, at [6.4].

[21] Exhibit A4, T292/6203; at [6.7].

Item is not to be understood as though it refers to the principal activity of preventing or controlling diseases in human beings. The focus is on the activity of promoting and not the activities of preventing or controlling.

130. We note again the statement in the Explanatory Memorandum to the 2001 Amendment that the charitable institutions to which the predecessor of Item 13 referred were not those providing direct relief of sickness or suffering. In addition, public benevolent institutions of the kind to which the Explanatory Memorandum for the 2001 Amendment referred, namely, those promoting or conducting "the relief of poverty, distress, suffering or misfortune", continue as Item 14 charities. It is not necessary to construe Item 13 expansively so as to encompass charities of that kind.

131. A further reason for understanding Item 13 as not encompassing the relief of sickness, suffering and the like, is the presence of Item 1 "advancing health". Section 14 of the Charities Act provides in relation to this subtype:

> 14 *Purpose of advancing health*
>
> Without limiting what constitutes the purpose of advancing health, the ***purpose of advancing health*** includes the purpose of preventing and relieving sickness, disease or human suffering.

Accordingly, that type of charity seems capable of encompassing a wide range of activities for the advancement of health, including the provision of health services, education and training. In particular, it includes the purpose of preventing, and relieving sickness, disease and human suffering. It is not readily to be supposed that Item 1 and Item 13, even if having some overlap, are to encompass wholly the same matters. Item 1 seems better adapted to those providing treatment, assistance and relief to the sick and suffering.

132. Finally, had Item 13 been intended to encompass the direct alleviation of sickness and suffering, it seems likely that a form of words more apt for that purpose would have been used.

133. As already indicated, the distinction evident in the legislative history and structure is important in the circumstances of this case. It may be that [7.9] of the ACNC Interpretation Statement quoted earlier does not reflect this distinction adequately.

134. Obviously enough, the activities of an institution to promote the prevention or the control of diseases may not be successful. However, they will not cease to be activities of the required kind on that account only. What is necessary is that the identified principal activity of the institution is *to promote* the prevention or control of diseases in human beings.

135. The question of whether the audible noise (of any frequency) or the infrasound produced by the operation of wind turbines has adverse effects on human health is controversial. In particular, there is debate about whether the sound emissions of wind farms have direct effects on human health. There is a considerable body of literature to the effect that there are no direct adverse effects. As noted, both the Assistant Commissioner and the Commissioner concluded that the weight of rigorous, credible scientific research is to the effect that there is no consistent evidence that infrasound, low frequency noise or vibrations from wind farms or other sources cause health effects in human beings (eg, Commissioner at [345]).

136. In the proceedings in this Tribunal, the Commissioner submitted that the applicant had to establish that its principal activity was directed towards the prevention or control of a disease and that that disease "must exist", or, using terminology adopted in *Healthy Cities* at [46], is "identifiable".[22] Counsel elaborated this by saying at one stage that there must be "credible medical evidence" that the proffered disease does exist.[23] Later, however, counsel submitted that the Tribunal had to be satisfied that the applicant's principal activity is directed to promoting the prevention or control of something which, on the balance of probabilities, can be characterised as a disease.[24] Later again, counsel submitted that the proffered disease had to be "established" as a disease.[25] A related submission was to the effect that the applicant had to establish on the balance of probabilities a causal relationship between the noise or vibration of wind farms, on the one hand, and a disease, on the other.

137. We do not accept these submissions of the Commissioner. In our view, when the term "promote" is understood in the way we have outlined earlier, Item 13 is not to be

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[22] Transcript, 21 September 2016, p 713 line 16.

[23] Ibid, p 713 lines 37-39.

[24] Ibid, p 714 line 5.

[25] Ibid, p 716 line 7.

construed as though it included an adjective such as “established” or “accepted” before the word “diseases”. The Tribunal ought not read in words of limitation which the Parliament has not chosen to use.

138. We do not regard the current non-acceptance by the medical and scientific community of many of the asserted health effects of wind farms as being determinative of the question of whether the principal activity of the applicant is *to promote* (in the sense we have explained) the prevention and the control of diseases in human beings. Speaking generally and without particular reference to the applicant, we consider that credible or plausible evidence that a condition exits, or that a causal relationship exists between a particular activity or exposure and an adverse health condition may be sufficient for the purposes of Item 13 in s 25-5 of the ACNC Act. It is not uncommon in human experience for the appreciation that an activity or exposure is injurious to human health to develop over time. In the way scientific understanding and knowledge develops, it can sometimes take time for the association between an activity or exposure, on the one hand, and an effect on human health, on the other, to become accepted. This is particularly so if the activity or exposure has previously been thought to be benign or advantageous. Likewise, it can sometimes take time for there to be recognition that an activity or exposure can give rise to forms of disease which have not previously been recognised. Asbestosis and the association between tobacco smoking and lung cancer provide examples.

139. The people who first call for such conditions to be recognised or for the association between a known disease and a particular activity or exposure to be accepted may be said to promote the prevention or control of diseases in human beings even though their activities are, for at least a time, without general support and perhaps unpopular and occur before the disease becomes “established”, “identified” or can be said to “exist”.

140. It follows that we do not consider that the present application is to be resolved by a determination of whether the applicant has established that wind turbines do have an injurious effect on human health. Account may be taken of evidence which falls short of satisfying that standard. Such evidence may indicate that there is a plausible basis for thinking that a disease may exist or that the association between an activity and a disease is plausible so as to warrant further investigation. It may be open to find that the applicant, as the proponent of further investigation and research in these circumstances, is promoting the prevention or the control of diseases in human beings.

141. This does not mean that any institution promoting recognition of a novel disease, or promoting the recognition of an association between an activity and a disease, will fall within Item 13. That subtype cannot reasonably be regarded as concerned with potential diseases which are far-fetched or with associations which are speculative only. However, it is appropriate to proceed on the basis that an institution whose principal activity is the promotion (in the sense we have explained) of the prevention or the control of a disease for which there is at least a reasonable basis for hypothesizing that it exists may be within Item 13.

142. We also consider it appropriate to be open to the possibility that sound emissions from wind farms may have indirect health effects, which in turn cause or contribute to diseases. It is not apparent to us that, in order to be regarded as promoting the prevention or control of diseases, the relevant activities must be directed toward the most immediate or proximate cause of a disease. As acknowledged in the Commissioner's Information Statement, it may be sufficient that activities are directed toward adverse health effects which, themselves, are associated with a disease or diseases.

143. In our view, there is also no necessity for the applicant's activities to be directed toward preventing a 'new' disease. It may be sufficient that the applicant's activities are directed toward a plausible 'new' cause for a well-known disease or diseases, or even simply reducing the number of people who are affected by a particular disease or group of diseases, or the extent to which they are affected.

THE APPLICANT'S ACTIVITIES

The applicant's contention as to its principal activity

144. In its SFIC, the applicant stated its activities as follows:

> From the point of establishment, the applicant's activities have primarily focused on the collation and dissemination of relevant existing research; and promoting, organising and funding further research into the adverse health consequences suffered by persons exposed to *excessive noise and vibration*. Those activities are also based on a recognition that the effects of exposure to *excessive noise and vibration* are inconsistent with established human rights, including the "right of everyone to the enjoyment of the highest attainable standard of physical and mental health". To those ends, the applicant has provided direct assistance to persons suffering from the effects of exposure *to excessive noise and vibration*; and has engaged at the political level advocating for noise regulations

and planning regulations and guidelines which adequately protect human health and prevent or control diseases in human beings.[26]

145. The applicant then went on to particularise its activities saying that it:

(a) collects and collates relevant research relating to the known adverse health consequences of excessive industrial sound and vibration which it then circulates to a network of relevant researchers, health and acoustic professionals and noise affected people in Australia and internationally, at [20]. The applicant noted that the research it had gathered was used as a basis for expert evidence given in courts and planning tribunals in which the health effects caused by excessive noise were in issue;

(b) provides research, data and information on request to a variety of interested parties, including noise affected people, health professionals, acousticians, researchers, public servants, politicians, the media and lawyers, at [22];

(c) promotes, encourages and organises research into the adverse health consequences of excessive noise or vibration by placing noise affected people in contact with independent acousticians and researchers; and shares research techniques with others in an effort to produce better research, at [23], [33] and [40];

(d) assists noise affected people to accurately and systematically document the noise effects they experience by providing them with pro forma environmental noise and sleep diaries, at [24]. The applicant said that the data so gathered provided the basis for detailed scientific investigation into the effects of exposure to excessive noise;

(e) contributes, depending on available funds, towards the costs of collection of acoustic and physiological data from noise affected people, at [25];

(f) supports and encourages the development of new acoustic instrumentation aimed at obtaining more accurate measurement of low-frequency noise and infrasound

[26] Applicant's SFIC, at [19] (emphasis added).

and assists in the development of new data analysis methods and techniques used by researchers, at [26];

(g) receives and responds to communications from people who are adversely affected by noise or vibration and provides those persons with reliable information and advice, at [28] and [29];

(h) in urgent cases requiring immediate attention, assists people to obtain prompt medical attention, at [30];

(i) assists noise affected people by placing them in contact with qualified noise experts and researchers for the purpose of carrying out objective investigations into their complaints, at [31];

(j) assists noise affected persons by providing written and oral submissions and evidence to planning panels, tribunals and planning ministers, and by making submissions to Parliamentary inquiries, at [32] and [35];

(k) assists, where possible, to find alternative accommodation to noise affected persons in order to avoid permanent harm, at [31];

(l) establishes and maintains good communications networks nationally and internationally with researchers and experts with relevant qualifications in health and acoustics by circulating relevant information, data and research in a timely fashion, by encouraging researchers to collaborate when appropriate, and to carry out targeted research into the adverse health consequences of exposure to excessive noise or vibration, at [37] and [38];

(m) encourages and supports research by members of communities adversely affected by noise, at [39];

(n) provides decision-makers such as the Federal and State Governments, planning and health departments and authorities responsible for noise regulation with research, evidence, information and submissions, at [41] and [42].

Overview of submissions

146. In his written opening submissions, counsel for the applicant submitted at [9] that the applicant's evidence:

> demonstrates that the applicant's principal activity concerns noise or vibration generated from the industrial sources, generally; including coal-fired power plants; gas-fired power plants and coal mines; and the illnesses and disorders suffered in consequence of exposure to such noise or vibration.

147. In his written closing submissions, counsel submitted at [27] that the principal activity of the applicant was promoting the control or prevention of diseases by and through**:**

> 27.1 receiving and responding to complaints of noise related health effects;
>
> 27.2 raising awareness of the effects of long-term exposure to industrial noise or vibration by making publicly available information on the health risks posed by such exposure and establishing networks between complainants and researchers;
>
> 27.3 funding or arranging for appropriate acoustic measurements to be carried out inside complainants' homes;
>
> 27.4 providing advice to noise complainants to record their sleep patterns and/or to seek out medical assistance in relation to the health effects associated with their noise complaints, as raised with the applicant;
>
> 27.5 providing advice on avoiding exposure to excessive noise by moving away from the complainants' home and the noise source [and] [a]rranging for alternative accommodation to assist complainants in that respect;
>
> 27.6 lobbying and encouraging others to lobby government, health bodies, planning authorities and noise regulators for improved regulations regarding noise and vibration and to encourage enforcement of existing regulations;
>
> 27.7 encouraging and assisting with research aimed at quantifying complainants' noise exposure and working with acoustic experts to develop and improve acoustic testing equipment and techniques.

148. The applicant's overall submission was:

> The evidence demonstrates, unequivocally, that the applicant's principal focus is on promoting the prevention or control of diseases in human beings caused by, contributed to, or associated with noise or vibration generated by a broad range of industrial noise sources, including: coal and gas-fired power stations; gas extraction; coal mining; as well as noise from industrial wind turbines, which the evidence shows is most certainly audible.[27]

149. The applicant sought to support those submissions by reference to its Constitution, as amended from time to time; evidence from lay witnesses, including the applicant's current

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[27] Applicant's written Opening, at [42].

CEO, Ms Sarah Laurie; and evidence from a number of acoustic and medical experts. In addition, the applicant referred to documents contained in the T-documents.[28]

150. We note at this stage the different forms of activity to which the applicant referred. Looked at in a general way, the applicant's main activities appear to be of the following kinds: responding to and providing information, advice or assistance to those who contact it, including those who claim to be affected by noise exposure; awareness raising particularly by the sharing and distribution of information; the promotion of, and provision of assistance to, forms of research; and some advocacy.

151. The Commissioner's overall submission was that the applicant's evidence did not prove in a satisfactory way the activities in which it engaged, let alone the relative primacy of those activities. The Commissioner noted that the "[c]onventional ways to establish an entity's principal activity may be to produce its annual reports, financial statements, minutes of meetings, strategic plans, budgets and/or records of the allocation of its staff time".[29] Without material of that kind, the Commissioner submitted that there is insufficient evidence for the Tribunal to make any proper assessment of how the time and funds of the applicant are spent, by activity, let alone to assess the principal activity of the applicant.

The applicant's Constitutions

152. The applicant's first Constitution was dated 8 June 2011. The objects stated in that Constitution were as follows:

> (a) gather, investigate and review complaints of health problems that have been perceived by the complainants as being associated with living or working close to wind turbines or such other industrial sources that may be considered as relevant.
>
> (b) continue to gather additional information from existing and new wind projects or other sources as it becomes available.
>
> (c) build the existing and new data into a high quality data base suitable as a start point for properly constructed studies and review by qualified others.
>
> (d) use the data to engage in co-operative studies with independent researchers both in Australia and internationally.

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[28] Applicant's SFIC, Appendix 2.

[29] Respondent's written Opening, at [6]. See also *Healthy Cities Illawarra Inc and Commissioner of Taxation* [2006] AATA 552; (2006) 63 ATR 1165, at [58].

(e) on the basis of data gathered plus local, overseas and co-operative studies, provide relevant and independent advice to communities, the public at large and local, state and federal governments and to the wind turbine industry and other relevant organisations.

(f) promote research into the effects and causes of illnesses that may be associated with living or working close to wind turbines and other relevant sources.

(g) make the results of such research widely available, to members of the public, health professionals, and other interested parties.

(h) facilitate the establishment of individual networks of relevant specialities of medical practitioners and other health practitioners to enable the rapid sharing of information and expertise in the diagnosis, management and treatment of patients with symptoms of wind turbine syndrome.

(i) provide such advice and assistance as can be given to individuals and communities who believe that their health is or may be impacted by adjacent wind turbines or other sources.

(j) assemble the necessary resources to carry out the objectives.

(k) raise such funds as may be possible to assist in the work of the Foundation.

(l) at all times to establish and maintain complete independence from government, industry and advocacy groups for or against wind turbines.[30]

153. The applicant's next Constitution came into effect in July 2014 following a special resolution of members on 18 July 2014.[31] The objects contained in this Constitution were broadly similar to those in the 2011 Constitution:

(a) Gather, investigate and review complaints of health problems that have been perceived by the complainants as being associated with exposure to wind turbines and other industrial sources of infrasound, low frequency noise (ILFN) and vibrations that may be considered as relevant.

(b) Gather additional information from existing and new wind projects and other environmental noise sources, and relevant health and acoustics research as it becomes available.

(c) Build the existing research and new field data into a high quality library and data base suitable as a start point for properly constructed studies and review by others.

(d) Use the data to engage in co-operative studies with independent researchers both in Australia and internationally.

(e) On the basis of field data gathered, plus local, overseas and co-operative studies, provide relevant and independent advice to communities, the public at large and local, state and federal governments as well as other relevant industries, organizations, and professionals.

(f) Promote research into the effects and causes of illnesses that may be associated with living or working close to wind turbines and other relevant environmental noise sources of ILFN and vibration.

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30 Exhibit A4, T7/243.

31 Ibid, T11/345.

(g) Make the results of such research widely available to all interested parties in a transparent manner.

(h) Facilitate the establishment of individual networks of relevant specialities of medical practitioners and other health practitioners to enable the rapid sharing of information and expertise in the diagnosis, management and treatment of patients with symptoms of diseases known as “wind turbine syndrome” and “vibroacoustic disease” as well as “environmental sleep disorder” and other symptoms and health conditions resulting from exposure to infrasound and low frequency noise (ILFN) and vibration, historically called “annoyance” by acoustic engineers and researchers.

(i) Provide such advice and assistance as can be given to individuals and communities who believe that their health is or may be impacted by adjacent wind turbines or other sources of ILFN and vibration. This may include but is not limited to assistance with accessing knowledgeable acoustic and health professionals, accessing researchers, accessing respite accommodation, and assistance with the provision of expert evidence.

(j) Provide assistance with preparation of complaints with respect to breaches of human rights. Such breaches of human rights could include but are not limited to breaches of the following Conventions to which Australia is a signatory:

- UN Convention on elimination of racial discrimination
- UN Convention against torture and other cruel inhuman or degrading treatment or punishment
- UN Convention on the rights of the child
- UN Convention on the rights of people with disabilities

(k) Assemble the necessary resources to carry out the objectives.

(l) Raise such funds as may be possible to assist in the work of the Foundation.

(m) To establish and maintain complete independence from government, industry and advocacy groups for or against wind turbines or other sources of ILFN and vibration, but develop and maintain collaborative working relationships with all key stakeholders.[32]

154. We note that the first seven objects in each of these Constitutions related, in one way or another, to research.

155. A new Constitution came into effect on 9 January 2015.[33] However, our conclusion as to the material time at which we are to consider the matter makes it unnecessary to refer to this or any later Constitutions of the applicant.

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[32] Ibid, T8/259-260.

[33] Ibid, T9/285.

Evidence of Sarah Laurie

156. Ms Laurie is a qualified medical practitioner and in the past practised as "a specialist rural General Practitioner".[34] She became involved with the applicant shortly after its inception in 2010,[35] and "joined" it in August 2010. She explained in her affidavit "I joined the Foundation … after [a] discussion with Mr Mitchell, and have worked in a pro bono capacity ever since, initially with the title of "Medical Director" which subsequently changed to Chief Executive Officer (CEO) to better reflect the role".[36] Ms Laurie said that this has been a full time role.[37]

157. With respect to the motivation and activities of the applicant, Ms Laurie said, in a somewhat conclusionary and self-serving way:

> The consistent core motivation of the Foundation is our principal activity which has now been stripped down to its bare essentials in our constitution, but has always remained the same in essence even with the original objectives – namely **"to promote human health and wellbeing through the prevention and control of diseases and other adverse health effects due to industrial sound and vibration"**.[38]

158. She went on to indicate that "as time has gone on" human rights issues have become a greater focus of the applicant. Accordingly, she indicated that the applicant had recently amended its Constitution again (on 26 April 2016) to include specific reference to human rights.[39] As we will note later, Ms Laurie provided little detail of what the applicant has done in relation to human rights, apart from saying that it has assisted "a couple of families" with advice in relation to complaints to the Australian Human Rights Commission (AHRC)[40] and assisting some people in preparing statements for submission as part of complaints to the AHRC.[41]

159. Ms Laurie explained in her oral evidence that, to a significant degree, the day-to-day work of the applicant was reactive or responsive to the requests made to it. The way in which her time and that of others was allocated was dictated, to an extent, by the requests made

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34 Exhibit A7, at [3].
35 Ibid, at [26].
36 Ibid, at [34].
37 Ibid, at [76].
38 Ibid, at [98] (emphasis in original).
39 Ibid, at [108].
40 Ibid, at [100].
41 Ibid, at [100], [103].

to the applicant by members of the public approaching it for assistance in dealing with noise issues. She explained that the applicant would endeavour to support people who approached it. That support included emotional support, practical assistance, provision of information, and putting people in touch with others similarly affected and, in some cases, appropriate experts. She makes herself available by phone or email "24/7" and has had few breaks over the last six years.[42]

160. Ms Laurie deposed that currently she and Ms Susan Richmond were the "first responders". We understand that to mean that it would be Ms Laurie or Ms Richmond who would respond to telephone or emailed requests from members of the public for assistance. Sometimes these were in the nature of a "cry for help" and an urgent response was required. Ms Richmond did not give evidence in the hearing. Ms Laurie described her as Mr Mitchell's "long standing Personal Assistant" and as the "Volunteer Administrator". It was not suggested that Ms Richmond has any particular qualifications or expertise relevant to her role as a "first responder".

161. In her affidavit, Ms Laurie said that the "first priority" of the applicant was "meeting immediate needs of noise impacted people", and went on to state:

> The Foundation's work is prioritised to firstly always give preference to the immediate needs of sick and desperate people who contact the Foundation. We have learned that the degree of distress is such that some people are suicidal by the time they reach out to the Foundation.[43]

162. Ms Laurie further explained that, while people contacting the applicant for assistance were often in a distressed or desperate state, most requests for help were "less urgent" and were "for general or specific information related to" the individual's particular circumstances.[44] She also said "[s]ometimes we are asked for names of health and acoustic professionals with expertise, knowledge and professional integrity who have a track record of providing competent professional services in this area".[45]

163. She added that, at times, "low frequency noise sensitised people request contact with others similarly affected, across the same or different noise sources, and those

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42 Ibid, at [129].

43 Ibid, at [123].

44 Ibid, at [145].

45 Ibid, at [145].

connections have been facilitated by the Foundation, both in Australia and internationally".[46] She said:

> These connections and additional supports and sources of information have helped alleviate some of the isolation felt by severely noise impacted people, which in turn helps to reduce their stress and thereby improves their health and wellbeing and reduces the risk of them developing stress-related diseases and mental health disorders because of that isolation.[47]

164. Ms Laurie said that she did not make any record of those who contacted the applicant, whether by telephone or email. With respect to the latter, there is the email trail. Ms Laurie acknowledged that it would be possible by reference to the emails to identify the subject matter of the contacts with the applicant and said, further, that when she had responded by email to telephone contacts, she had sometimes recorded the content of the telephone call, so that it may be possible in some cases to obtain details of the contact such as the source of noise complained of or the nature of the complaint (eg, sleep disturbance) given by the contact. Despite this, the applicant did not adduce any evidence of this kind.

165. The applicant did not produce any statistics or like data regarding its contacts with members of the public. The Tribunal is accordingly unable to make any assessment of the pattern, frequency or subject matter of the contacts by reference to evidence of this kind.

166. Ms Laurie identified "Priority 2" of the applicant as field research, and facilitating research by others.[48] She said:

> I have spent thousands of hours over the last six years listening carefully to people describe what is happening to them, to their families, to their animals, and carefully reading their emails and letters and submissions to others, in order to try and better understand what sort of targeted scientific field and laboratory research is required to directly investigate these reports.
>
> ...
>
> I also prioritise time spent developing, assisting or otherwise facilitating a range of research initiatives conducted by others as this is a core objective of the Foundation – to progress the multi-disciplinary research which will help refine the noise pollution and planning regulations to protect people. These have included noise investigations, psychoacoustic research projects, community based population noise impact surveys, multidisciplinary

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46 Ibid, at [150].

47 Ibid, at [151].

48 Ibid, p 38.

> research involving concurrent collection of the full spectrum of acoustic data together with physiological and diary research evidence.[49]

167. Ms Laurie deposed to the role of the applicant in providing logistical support to researchers[50] and to occasions when the applicant had supported aspects of acoustic monitoring and research.[51] She also referred to the applicant's role in "facilitating and encouraging the development and field trials of new acoustic instrumentation at a range of industrial noise locations including coal mines, coal fired power stations and wind turbines",[52] and "conducting the first multi-disciplinary acoustic and physiological data collection at the homes and other sites of members of two households from Lithgow in NSW, adversely affected by sound and vibration from a coal fired power station and an extractor fan from an underground coal mine".[53]

168. In addition, Ms Laurie referred to the applicant's activity of "distributing and publicising newly rediscovered 'old' relevant research, circulating new research papers, discussing and evaluating research findings, helping to draw up or comment upon new research proposals developed by others, and linking up researchers directly with noise impacted people".[54]

169. She added:

> Our website library is also a crucial tool for information to educate the public, to educate ourselves, to fine tune the development of research projects to fill existing knowledge gaps by educating professionals as well as the community more broadly, and making that information permanently available.[55]

and:

> The professional and research networks fostered by the Foundation are international and multidisciplinary across health, acoustics, and related disciplines, and have played a useful role in sharing knowledge across a range of disciplines, which has further helped develop, refine and critique research initiatives and progress our understanding across different disciplines.[56]

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49 Ibid, at [155], [159].
50 Ibid, at [161].
51 Ibid, at [161].
52 Ibid, at [161].
53 Ibid, at [161].
54 Ibid, at [162].
55 Ibid, at [163].
56 Ibid, at [166].

170. Ms Laurie described the third priority of the applicant as "[e]ducation of the community, including decision makers".[57] She said in her affidavit:

> This priority area has involved the education of many different groups. These include the broader community, noise affected people, health professionals providing care to noise affected people, and decision makers such as public servants, politicians, and the media about the known and emerging health problems and the existing (and required) research.[58]

171. Ms Laurie also deposed to the applicant's "active participation in a number of parliamentary inquiries",[59] and "accepting invitations from community groups and individuals to give community presentations in public and private".[60] She also referred to the applicant's participation in and presentations at various conferences, and presentations to groups of medical practitioners. She added "[o]n occasions education initiatives have also included providing written and oral testimony to planning tribunals or other legal or planning bodies, when requested to do so by local residents or their lawyers and where resources permit".[61]

172. Ms Laurie deposed that the applicant was active in playing an advocacy role through writing letters, preparing documents and making submissions to Senate inquiries.[62] She further deposed that, as part of her work for the applicant, if requested, she would visit particular communities or an individual, and attend public and/or private meetings.

The establishment of the Waubra Foundation

173. Ms Laurie said that the applicant (then known as the Waubra Disease Foundation) had been "established" by a Mr Peter Mitchell in March or April 2010.[63] Mr Mitchell and a Ms Russell had been its inaugural directors. The evidence did not disclose what was done in March or April 2010 to "establish" the applicant, nor its legal status at that time. It seems that Ms Laurie became a director of the applicant soon after she joined it in August 2010.[64]

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57 Ibid, p 43.
58 Ibid, at [172].
59 Ibid, at [179].
60 Ibid, at [180].
61 Ibid, at [184].
62 Ibid, at [112].
63 Ibid, at [26]-[27].
64 Ibid, at [33]-[34], [70].

174. Although given the titles of "Medical Director" and "Chief Executive Officer", Ms Laurie has never been employed by the applicant – in fact it has never employed anyone.[65] Ms Laurie does not seem to have day-to-day activities or responsibilities of the kind usually associated with the titles of Medical Director or Chief Executive Officer.

175. Ms Laurie could provide only limited information regarding some matters concerning the applicant. Despite being its CEO, she did not know how many members it has and made a "guess" that it could be 10.[66] She did not know how a person could go about becoming a member, saying that the applicant had never had anyone approaching it seeking to join. She did, however, know that there is no membership subscription.

176. The applicant's registered office is at a firm of accountants in Collins Street, Melbourne. Ms Laurie said that she and Ms Richmond operate from their own homes.

177. Ms Laurie said that, in the past, the Board of the applicant had met monthly, but did not describe the manner in which it had done so.[67] She said that the Board has not been able to afford to meet since the Assistant Commissioner's decision of 11 December 2014 and the "freeze" on its funds. The applicant did not tender any agendas or minutes relating to Board meetings, nor any documents in the nature of reports or strategy papers considered by the Board. Nor did the applicant tender any evidence of "action" items resulting from Board decisions. In fact, so far as the evidence goes, there is no evidence of any Board resolutions concerning the activities in which the applicant engages nor of any oversight by it of Ms Laurie or Ms Richmond. This may be because the applicant's activities are determined by the requests and complaints it receives, that is, because it is "reactive rather than proactive".[68]

178. It is very evident that, in practice, Ms Laurie is the one who determines what the applicant does and how it applies its resources. This was reflected in the acknowledgment of counsel for the applicant in his final submissions that Ms Laurie "is in all practical substance the applicant". The close identification of Ms Laurie with the applicant, together with the absence of evidence that the applicant operates in a conventional way as an

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65 Transcript, 6 September 2016, p 101 lines 22-27.

66 Ibid, p 102 lines 21-26.

67 Ibid, p 116 lines 36-38.

68 Ibid, p 117 line 40.

organisation directing and supervising her activities, renders difficult to an extent the task of determining the applicant's principal activity, as opposed to that of Ms Laurie.

The evidence of the applicant's finances

179. Ms Laurie annexed to her affidavit a single page document entitled "Waubra Foundation Summary of Expenditure 1 July 2010 to 18 April 2016".[69] It is obvious that this document is not a primary or source financial record and that it had been prepared for these proceedings. Ms Laurie acknowledged as much.[70] No explanation was given to the Tribunal for the applicant having presented a constructed document, rather than source documents.

180. We set out the contents of the summary in full:

Waubra Foundation Summary of Expenditure

1st July 2010 to 18 April 2016

TOTAL Expenditure 1 July 2010 – 18 April 2016	$185, 031
Acoustic Field Research/Instrument R & D [1] (36.27%)	$67,109
• Hire of acoustic monitors	
• Travel and accommodation costs of acoustic researchers	
• Purchase of physiological sensors for researchers	
• Funding R & D for development and testing of acoustic monitors – infrasound specific and full spectrum	
Education [2] (27.83%)	$51,498
Legal – educating courts re noise and health [3] (8.93%)	$16,529
• Payment to lawyers to assist with the costs of Acoustic Expert Les Huson to collect acoustic evidence (Quinn appeal - $5,000)	
• Legal representation for lay witnesses and expert witness, and fee for expert witness Les Huson at VCAT (Cherry Tree $11,529)	
Legal – protecting the Foundation[4] (10.98%)	$20,324
Communication and Travel[5] (5.93%)	$10,967
Administration [6] (10.06%)	$18,604

[1] Acousticians who have done acoustic field testing at the request of the Foundation and had some of their expenses paid include Steven Cooper, Les Huson, and the Rapley and

[69] Exhibit A7, "SEL 1".

[70] Transcript, 6 September 2016, p 105 lines 3-10.

Atkinson team in New Zealand. Locations include Lithgow and Taralga, NSW, Mt Bryan, Waterloo and Millicent in SA, Cape Bridgewater in Victoria

[2] "Education" includes expenses related to the development and ongoing maintenance of the website and resources library, materials on the website, and the DVD production

[3] The Foundation has assisted with provision of evidence to other court cases both in Australia and in Canada (Ontario and Alberta) completely pro bono.

[4] Defamation of Foundation by PHAA defamatory document, and AAT costs to date

[5] Communications and travel includes some of the CEO's phone and travel costs. The rest of these expenses were paid by the CEO's husband.

[6] Includes accounting, auditing, bank charges, ASIC fees, registered office fees, Insurance, Computer Maintenance, postage, stationery.

181. As can be seen, the Summary of Expenditure indicates total expenditure over a period of five years and 10 months with the largest item ($67,109 or 36.27%) said to be "acoustic field research – instrument R&D"; the second largest item ($51,498 or 27.83%) said to be "education"; and the third largest item ($20,324 or 10.98%) said to be "legal – protecting the Foundation". Some $10,967 (5.93%) is attributed to "communication and travel". This is said to include "some of the CEO's phone and travel costs" with the rest of "these expenses" having been paid by the CEO's (Ms Laurie's) husband.

182. A number of observations may be made concerning the Summary of Expenditure. First, it provides very little by way of particularisation of the expenses shown.

183. Secondly, the item "Administration" is said to include "accounting" and "auditing". Ms Laurie confirmed in her oral evidence that annual financial statements were prepared and audited and had been lodged with the Australian Securities and Investments Commission (ASIC) and, more recently, with ACNC. Despite this, none of the annual financial statements were put in evidence. Nor did the applicant adduce evidence of periodic financial statements or financial reports of the kind which Ms Laurie may have provided to the Board in her capacity as CEO. The applicant has not provided any evidence at all of the way in which the Board exercised control or supervision of the expenditure of its funds and from which references as to the applicant's activities may be drawn.

184. Thirdly, it may be inferred from the reference to "bank charges" that the applicant has at least one bank account, but no statements relating to that account were tendered. This precludes the Tribunal making any assessment of the time or pattern of the applicant's expenditure. In particular, it is not possible to tell from the summary of expenditure when,

in the 70 month period to which it relates, the expenditures were made, let alone those made in the period relevant to the Tribunal's decision.

185. Fourthly, the summary contains no details of the applicant's income. Accordingly, it is not possible for the Tribunal to determine when the income to which the expenditure relates was received.

186. Fifthly, it is not possible for the Tribunal to determine whether some or all of the expenditures were of a one off or infrequent kind, on the one hand, or were periodic payments, on the other. Nor, other than in limited respects, can the Tribunal make any assessment of the activity of the applicant to which the expenditures were directed. In some instances, inferences can be drawn from other evidence. For example, Ms Laurie's evidence indicates that the applicant has its own telephone number and website.[71] We accept that maintaining those facilities is likely to have involved some expense but cannot determine whether that is an expense which has been met by the applicant personally, or by others on its behalf.

187. Sixthly, it is apparent that approximately 20% of the applicant's expenses have concerned litigation, on its own account and for others. The extent of its activities in that respect is not apparent from the evidence. Importantly, it has not been shown that activities of that kind have a direct relationship with the promotion of the prevention or control of diseases.

188. Overall, the evidence of the applicant's finances was presented in an unorthodox and unhelpful way. The manner in which it was provided precludes the Tribunal from having a complete understanding of the applicant's financial position or of the manner in which it operated financially, and in turn of its activities.

Other lay witness evidence

189. A number of the other lay witnesses described their contact with the applicant and Ms Laurie. The evidence in chief of these witnesses was contained in affidavits. It seemed that little, if any, regard had been had to the rules of evidence including the rules

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[71] Exhibit A7, at [126]-[127]; the Summary of Expenditure indicates that the website is one of several components of the applicant's 'education' work, which comprise about a quarter of its expenditure.

concerning hearsay in the preparation of the affidavits.[72] Much of the evidence was expressed in general terms, in a conclusionary manner, or assumed the truth of the matters which the applicant seeks to establish. The witnesses did not always distinguish between activities of Ms Laurie, on the one hand, and the applicant on the other. While generally we have accepted the evidence of the lay witnesses, these matters in combination have limited its utility. Nevertheless, the lay witnesses' evidence concerning the applicant's activities was helpful.

190. Mr Norman Allan, a resident of Lithgow in New South Wales, complained of the noise and vibration from large ventilation fans operating at a nearby coal mine. By searching, he had found the applicant's website and had sent an email to the address provided. Mr Allan deposed that he had received a response "within hours" and that Ms Laurie had contacted him within two days, providing him with information and resources. He said that the applicant had organised his involvement in educational community seminars and his participation in a research project which included the undertaking of acoustical testing.

191. Mr Nathanial Barton is a farmer from Wellington in New South Wales. His concerns related to the then proposed Wellington gas-fired power station. He obtained the details of Ms Laurie and contacted her. Ms Laurie had responded immediately, referring him to the information available on the applicant's website which he then accessed. In addition, Ms Laurie had provided Mr Barton with a copy of the applicant's "explanatory document on environmental noise impacts" and with other scientific material. On 6 August 2014, Ms Laurie wrote, on Mr Barton's behalf, a letter of objection to the Wellington gas-fired power station, raising concerns about "the impact of infrasound, low frequency noise (ILFN) and vibration". Ms Laurie prepared a powerpoint presentation for use at a public meeting concerning the proposed gas-fired power station and the applicant published on its website material concerning the proposal and its apprehended effects.

192. Mr Lance Batey, a resident of Mount George in New South Wales has had dealings with the applicant since early 2011 in relation to coal mine noise. He deposed that Ms Laurie had travelled to his area to speak to locals who were similarly concerned.

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[72] We acknowledge that we are not bound by the rules of evidence. However, as has been repeatedly observed by the Federal Court, those rules are often the best guide to determining whether evidence is relevant, probative and can fairly be received.

193. Mr Peter Brown, a resident of Muswellbrook in New South Wales said that Ms Laurie had contacted him in about March 2014, following his introduction to Mr Batey. He deposed as follows:

> Very soon after Sarah Laurie telephoned us and offered to give us any help or support that the Waubra Foundation was able to give. The mere willingness to listen to our problem and validation of our noise and health issue was in itself cathartic. Sarah told us of similar stories of other people's noise and health problems, which only steeled our resolve. Sarah followed up her initial phone call with a series of emails containing the links to various reports, testimonies and research in the area of Low Frequency Noise and its effects on humans.
>
> Since our first contact with Sarah, the Waubra Foundation has continued to help us in many varied ways; from the ongoing provision of updated research, putting us in contact with professional people, such as acousticians L Huson & Associates, and providing assistance and advice to us in dealing with all forms of government in our pursuit of a just outcome for our ILFN problem. Sarah continues to support us and we find the Waubra Foundation website a very helpful source of information on the illnesses caused by exposure to ILFN.[73]

194. Mr John Faint is now a resident of Kapunda in South Australia but formerly lived on his farm at Waterloo, South Australia. The Waterloo wind farm commenced operations in September 2010. Mr Faint's farmhouse is 4.3 km from the nearest turbine and 37 are visible from the house. Mr Faint described a number of symptoms which he attributes to the wind turbines. In relation to the applicant, he deposed:

> Dr Sarah Laurie from the Foundation has visited and talked to us on many occasions and shown real concern about our issues. … I have contributed financially to the Waubra Foundation and have received a good deal of valuable information and assistance from it.[74]

195. Mr Andrew Gardner is a farmer from Penshurst in Victoria whose property is close to the Macarthur wind farm. Seven of the turbines are within 1.7 to 1.9 km from his house. Mr Gardner describes a number of symptoms which he attributes to the operation of the wind turbines. He deposed that he had become aware of the applicant in late 2010 and continued:

> Dr Sarah Laurie has been such a wonderful comfort and support to both Annie and me, as have others, in particular Mr Peter Mitchell, also of the Waubra Foundation, since late 2010. … Not only have they communicated with AGL on our behalf, they have been available on the phone for us at any time, day or night.[75]

Later in his affidavit, Mr Gardner deposed:

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[73] Exhibit A16, Affidavit of Mr PJ Brown dated 22 April 2016, at [10]-[11].

[74] Exhibit A17, Affidavit of Mr JC Faint dated 22 April 2016, at [5].

[75] Exhibit A18, Affidavit of Mr AR Gardner dated 23 April 2016, at [15].

> For a long time I went into a deep depression. I could also say at times I felt a suicidal tendency and it was only when speaking to the most compassionate Dr Laurie on the telephone, I was able to learn to cope with these disturbing feelings. Dr Laurie, along with Mr Mitchell are the two people who have been responsible for my ability to keep going …
>
> I am totally indebted to the Waubra Foundation for their ongoing support and assistance in our efforts to handle the fact that our health, our life and livelihood has been taken away from us, through no fault of our own.
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> …
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> The support and assistance from the Waubra Foundation at a time when I felt I could hardly carry on, has been invaluable.[76]

196. Ms Ann Gardner, who we understand to be married to Mr Andrew Gardner, also described a number of symptoms which she attributes to the operation of the wind turbines of the Macarthur wind farm. In relation to the applicant, Ms Gardner deposed:

> Over more than the ensuing years, Dr Sarah Laurie and Peter Mitchell of the Waubra Foundation, have been my absolute saviours. Without the constant support and assistance from the Waubra Foundation, I do not know where I would be, but I know it would be in a very, very dark place.[77]
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> …
>
> I have been in regular contact with Dr Laurie and Peter Mitchell over the last six years now. Dr Laurie has visited so many families affected by wind turbines all around Australia and readily and generously gives her time to all of those. From my experience and what I know of the experience of others there are many who need support and reassurance, sometimes to literally get on with life. She has conducted meetings with affected residents in our district and at our home.[78]

197. She also referred to Dr Laurie and Mr Mitchell's advocacy on her behalf, and the value to her of the information contained on the applicant's website.

198. In his affidavit of 21 April 2016, Mr Gary Goland deposed that the applicant had posted on its websites articles and information which he had provided concerning topics related to noise and health.[79]

199. Ms Theresa Grima lives in Lidsdale in New South Wales. She complains of the effects of exposure to low frequency noise, infrasound and vibration from the ventilation fan at the

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[76] Ibid, at [18]-[19], [21].

[77] Exhibit A19, Affidavit of Ms AC Gardner dated 23 April 2016, at [23].

[78] Ibid, at [25].

[79] Exhibit A20, Affidavit of Mr G Goland dated 21 April 2016, at [16].

Springvale coal mine and the Mount Piper power station. Ms Grima describes a number of symptoms which she attributes to that exposure.[80]

200. Ms Grima described contact with the applicant from some time in 2014, saying that she has had face to face contact with Ms Laurie on three occasions but otherwise has weekly contact with her. The assistance which the applicant has provided includes reference to guidelines, regulations and research data on the topics of noise, sleep and health; contact with other affected residents; provision of information regarding the 2015 Senate Inquiry into wind turbines; a seminar conducted by the Woolcock Institute of Medical Research on noise and health; encouragement and assistance in lodging submissions and/or giving evidence to the Senate Inquiry, to the New South Wales Planning and Assessment Commission and to the New South Wales Environmental Protection Authority; encouragement to keep diary logs of the disturbances, sensations and symptoms they experience; and the opportunity to participate in noise related research. Ms Grima deposed:

> The Waubra Foundation has always been available to my family and reached out to us in our time of need offering coping strategies. Dr Laurie has, on numerous occasions, phoned to check up on our welfare, and also while travelling through the area has taken the time to visit our home to show her support and check on our well being.[81]

201. Ms Janet Hetherington is a resident of Penshurst, Victoria whose property is close to the Macarthur wind farm. The closest wind turbine is about 3 km from her house. Ms Hetherington describes a number of symptoms which she attributes to her exposure to wind turbine noise and vibration. She deposed that the applicant had assisted her with the writing of letters to different governments and government agencies responsible for noise regulation and to the CEO of a private hospital she had stayed at and where she had experienced excessive noise and vibration.[82]

202. Ms Bernadette Janssen is a resident of Evansford, Victoria who has lived near the Waubra wind farm since 2009. The closest turbines are about 3.4 km from her home and are only visible from specific locations on the property, namely the studio and the west veranda. Ms Janssen describes a number of symptoms which she attributes to her exposure to wind turbine noise and vibration. In relation to the applicant, Ms Janssen was

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[80] Exhibit A21, Affidavit of Ms TA Grima dated 22 April 2016.

[81] Ibid, at [32].

[82] Exhibit A22, Affidavit of Ms JL Hetherington dated 23 April 2016, at [8] and [28].

introduced to Ms Laurie by a mutual acquaintance in August 2010, which was before Ms Laurie had taken up a position at the applicant Foundation.[83] Ms Janssen deposed that Ms Laurie had assisted her with the documentation of her experience and symptoms, supplied her with the relevant literature, connected her with other noise-affected people and provided emotional support when Ms Janssen was feeling depressed.[84]

203. Ms Joanne Kermond is a resident of Portland, Victoria who previously lived near the Cape Bridgewater wind farm. Ms Kermond describes a number of symptoms she experiences which she attributes to her exposure to wind turbine noise and vibration. Ms Kermond deposed that the applicant had facilitated her communications with acousticians and medical practitioners and provided her with relevant literature and research.[85] She further deposed that the applicant had "organised a network of accommodation for emergency purposes",[86] which she has had to use more than once, presumably to remove herself from the perceived effects of wind turbine noise and vibration.

204. Ms Milka Mihaljevic is a resident of Burwood, New South Wales who has complained of exposure to an unknown source of low frequency noise. She describes a number of symptoms which she attributes to her exposure to low frequency noise. Ms Mihaljevic came across the applicant's website in July 2015 via an internet search and shortly thereafter contacted the applicant to ask if they could provide her with names of appropriate medical specialists so that she could seek medical advice on the issues she was facing. In due course, the applicant referred Ms Mihaljevic to an independent acoustician, to other links on the applicant's website and offered to introduce her to other noise-affected people.[87]

205. Ms Mary Morris is a farmer and private researcher from Eudunda, South Australia who lives 17 km from the Waterloo wind farm. Ms Morris describes a number of symptoms which she attributes to her exposure to wind turbine noise and vibration. She was given Ms Laurie's details by another Waterloo farmer. Ms Morris describes an arrangement between herself and the applicant whereby she would provide the applicant with relevant

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83 Transcript, 5 September 2016, p 34 line 16.

84 Exhibit A1, Affidavit of Ms BM Janssen dated 23 April 2016, at [35] and [40].

85 Exhibit A23, Affidavit of Ms JM Kermond dated 26 April 2016, at [49].

86 Ibid, at [47].

87 Exhibit A24, Affidavit of Ms MM Mihaljevic dated 21 April 2016, at [7].

literature on noise, some authored by herself, which the applicant would upload to its website.[88] She also describes a number of occasions on which she invited Ms Laurie to attend "stakeholder" meetings: for instance a meeting between Waterloo residents and the South Australian Environment Protection Authority (EPA) regarding its guidelines.[89] Also, at the invitation of Ms Morris, in 2012 Ms Laurie spoke at the Goyder Regional Council Development Assessment Panel on behalf of residents who claimed to be affected by the Waterloo wind farm.[90] Ms Morris credits the applicant with introducing her to relevant experts such as acousticians and epidemiologists, and for encouraging her to submit her own research to the NHMRC. That research was subsequently cited by the National Health and Medical Research Council (the NHMRC) in a published report.[91]

206. Ms Julie Quast lives near the Waterloo wind farm. Her home is about 2.5 km from the nearest wind turbine. She describes a number of symptoms which she attributes to her exposure to wind turbine noise and vibration. Ms Quast deposed that Ms Laurie advised her when they first met to keep a health diary, which she did and which she has also subsequently forwarded to the applicant so that it can be used to help other noise affected people.[92] Ms Quast also deposed that the applicant has arranged for her home to be tested by acousticians,[93] given her encouragement and on one occasion, arranged for her to attend a National Health and Research forum in Canberra on wind farms.[94]

207. Mr Colin Schaefer is a resident of Robertstown, South Australia who formerly lived 8 km east of the Waterloo wind farm. He has since moved to a property 15.5 km east of the wind farm. Mr Schaefer describes a number of symptoms he experienced whilst he was living on the property closer to the Waterloo wind farm, which he attributes to his exposure to wind turbine noise and vibration. Mr Schaefer deposed that the applicant arranged for his home to be set up with noise and meteorological monitoring equipment by different experts,[95] had encouraged him to keep a health diary,[96] had collected donations to fund

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88 Exhibit A25, Affidavit of Ms ML Morris dated 27 April 2016, at [14]-[15].
89 Ibid, at [18].
90 Ibid, at [20].
91 Ibid, at [23]-[26].
92 Exhibit A26, Affidavit of Ms JA Quast dated 22 April 2016, at [6] and [22].
93 Ibid, at [6].
94 Ibid, at [8].
95 Exhibit A27, Affidavit of Mr CR Schaefer dated 27 April 2016, at [16]-[18].
96 Ibid, at [11].

research[97] and had attended a meeting between Waterloo residents and EPA officials and acousticians.[98] Mr Schaefer also deposed that he has seen the applicant assist some of his neighbours in a similar way.[99] Regarding Ms Laurie specifically, he deposed:

> I cannot speak highly enough of Sarah Laurie. She has supported my family and me through many phone calls, emails, visiting my home, attending meetings with us, advocating at meetings on behalf of us, visiting me in hospital and has offered suggestions about what Heart Specialists were available in Adelaide.[100]

208. Mr Donald Thomas is a resident of Evansford, Victoria who lives and works within 3.5 km of the Waubra wind farm. The main part of his property has turbines in clusters on three sides within 1.2 km. Mr Thomas describes a number of symptoms which he attributes to his exposure to wind turbine noise and vibration.[101]

209. Ms Sonia Trist lives near the Cape Bridgewater wind farm. She describes a number of symptoms which she attributes to her exposure to wind turbine noise and vibration.[102] In relation to the applicant, Ms Trist deposed that Ms Laurie and Mr Mitchell provided her with information on wind turbine noise emissions and connected her with other noise-affected people and experts such as acousticians.[103]

210. Ms Melissa Ware lived near the Cape Bridgewater wind farm from 1995-2015. She describes a number of symptoms which she attributed to her exposure to wind turbine noise and vibration. Ms Ware deposed that her first contact with Ms Laurie was via email: Ms Laurie had sent an email to residents to suggest that they keep a health journal, speak to their local Council, report noise complaints and speak to their general practitioners to urge them to write letters to government authorities to request for acoustic monitoring in their homes.[104] Ms Ware further deposed that:

> Dr Laurie has introduced me to different people in Australia and overseas and by connecting with these people I feel less isolated and alone. Before any important meetings or events, or when I need information for letters that I am writing I have telephoned or

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97 Ibid, at [9].

98 Ibid, at [13].

99 Ibid, at [23].

100 Ibid, at [26].

101 Exhibit A2, Affidavit of Mr DR Thomas dated 23 April 2016; Transcript of 5 September 2016, p 37.

102 Transcript, 5 September 2016, p 40.

103 Exhibit A28, Affidavit of Ms Sonia Vyvyan Trist dated 27 April 2016 at [27]-[28].

104 Exhibit A3, Affidavit of Ms Melissa Ware dated 20 April 2016, at [34].

> emailed Dr Laurie for advice and assistance. She has been a great support when I lack the confidence in my ability to be heard.[105]
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> …
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> Dr Laurie and the Waubra Foundation have supported me to cope with the emotional and physical pain and suffering my family and I have experienced for seven years in living near the wind farm. Her support and gentle encouragement, her ability to listen without judgement or criticism, or without forceful recommendations to do this or that, have helped through some very dark moments when the noise and vibration were unbearable.
>
> Susan Richmond from the Waubra Foundation, has also been of great help and support to me … She helps by sending information that I am looking for and sometimes by proof reading any letters to regulators and politicians that I am working on. She has sent me documents that I am interested in using for my information and for the benefit of others.[106]

211. Several of these witnesses deposed to experiencing symptoms which they attributed to their exposure to noise or vibration. These included headaches, tinnitus, sleep disruption, sleep restrictions, stress and anxiety reactions and impaired concentration. The witnesses reporting symptoms included Mr Allan (noise from a coal mine so severe that he would wear industrial ear muffs and his children would have nose bleeds); Mr Batey (coal mining noise causing him to wake at night in fright and in panic); Mr Brown (coal mining noise preventing sleep and producing tinnitus, hypertension, depression and impaired concentration); Mr Faint (troubled sleep after the commencement of the Waterloo wind farm with sleep deprivation producing anxiety, feelings of tiredness and anger, and high blood pressure, among other symptoms); Mr Gardner (disturbed sleep, sleep deprivation, headaches and intense "bolts" of pain in the head after the commencement of the Macarthur wind farm); Ms Gardner (interrupted sleep, tinnitus, ear and noise pressure, headaches, heart palpitations, nausea and various pains after the commencement of the Macarthur wind farm); Ms Grima (sleep disturbance, a sensation of pulsating head pressure, nausea and dizziness from the drone or hum of the nearby coal mine); Ms Hetherington (sleep disturbance, muscle soreness, anxiety and other symptoms following the commencement of the Macarthur wind farm); Ms Janssen (sleep disturbance and deprivation, head pressure and aches, ear pressure, fluctuating blood pressure, depression and other symptoms after the commencement of the Waubra wind farm); Ms Kermond (headaches, nausea, broken sleep, lethargy and other symptoms after the commencement of the Waubra wind farm); Ms Mihaljevic (ear pain and pulsing sounds, disturbed sleep, insomnia); Ms Quast (sleep deprivation, nausea, headaches and other difficulties since the commencement of the Waterloo wind farm, the noise of which is

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[105] Ibid, at [40].

[106] Ibid, at [42]-[43].

"dreadful, like a truck or plane coming up the drive"); Mr Schaefer (sleeping difficulties, tinnitus and other symptoms following the commencement of the Waterloo wind farm, which was said to produce a noise like a truck or semitrailer); Mr Thomas (headaches, ear pressure, rapid heartbeat, sleep disturbance and exhaustion after the commencement of the wind farm); Ms Trist (waking with panic attacks, hypertension, high blood pressure and low concentration); and Ms Ware (sleep disturbance, headaches, tension, tinnitus and general lack of well-being after the commencement of the Cape Bridgewater wind farm).

212. The complaints of four of the lay witnesses related to noise from coal mines, rather than wind farms. However, that consideration can be put to one side for present purposes.

213. We accept that each of these lay witnesses was sincere in their report of the symptoms. We also accept their evidence to the extent that it was a report of their own observations, experiences and perceptions and of their contact with, and experience of, the applicant. However, we are not prepared to act on their evidence in so far as it purports to express an opinion in relation to association, causation or attribution. That is a matter requiring expert opinion evidence.

214. Before leaving this evidence, we record that many of the lay witnesses expressed gratitude to the applicant, and to Ms Laurie in particular, for the advice, practical assistance and emotional support they had received. It was apparent that many considered that the support and assistance they had received had had a beneficial effect on them and on their families.

The evidence of the expert witnesses concerning the applicant

215. A number of the experts called by the applicant also gave evidence concerning their contact with the applicant and knowledge of its activities. We will summarise that evidence here, and return later to their evidence with respect to the scientific issues.

216. Dr Robert Thorne is an acoustician with a Doctorate in Health Science, together with other academic qualifications relating to acoustics, noise control and public health. He deposed

that in 2010 Dr Laurie had approached him to "prepare a study program into wind farm noise and health", [107] but because of lack of funding, the study did not proceed.[108]

217. Dr Thorne also indicated that he is the CEO and Registrar of a registered training organisation, Acoustar, which specialises in training people in work, health and safety and in "noise management". He said that Acoustar are "very well placed to support the Waubra Foundation in the pursuit of higher quality, unbiased scientific research".[109]

218. Professor Alves-Pereira is a physicist with a Masters degree in Biomedical Engineering and a Doctoral degree in Environmental Sciences. In her statement she indicated that her first contact with the applicant was in 2011, when she was requested to "provide specific information based on our experience with 'low frequency noise'-induced pathology".[110] She went on to observe that:

> Since then, the Waubra Foundation website has grown to become an outstanding and singular hub of information, both for lay persons as well as for scientists. I have consistently recommended the Waubra Foundation website to numerous individuals who contact our group requiring more information on the possible health effects of "low frequency noise exposure".[111]
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> …
>
> The information hub provided by the Waubra Foundation also functions as a network among scientists worldwide who pursue knowledge in this niche of scientific inquiry, often times from considerably different fields of expertise. When I have a question regarding who might be looking at a specific aspect of "low frequency noise", the Waubra Foundation website is the first choice, and it operates as a springboard which allows quick access to this type of information.[112]

219. As will be seen, we are not prepared to attach any significant weight to the opinions of Professor Alves-Pereira but accept her evidence as to her use of the Waubra website.

220. Mr William Huson is a physicist specialising in acoustics. In his statement[113] and oral evidence, he explained that his first contact with the applicant was in 2011 when Ms Laurie contacted him seeking his assistance with respect to noise testing in the vicinity of

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[107] Exhibit A29.
[108] Ibid, at [89].
[109] Ibid, at [92].
[110] Exhibit A31, p 5.
[111] Ibid, p 5.
[112] Ibid, p 5.
[113] Exhibit A37.

the Leonard's Hill wind farm.[114] That wind farm is about half an hour away from his own residence. Mr Huson explained that he had arranged to see residents whose contact details Ms Laurie had given him. Ultimately he had conducted noise testing at three separate residences.[115] Mr Huson said that "this work was self-funded and some of the results were included in a paper".

221. Mr Huson went on to indicate that in December 2012, he was commissioned by the applicant to "take full sound spectrum measurements indoors at a number of dwellings surrounding the Waterloo, Cape Bridgewater and Lake Bonney wind farms.[116] He said:

> the large volume of data collected has yet to be analysed fully, however, after reading a report prepared by a Mr S Cooper for the Cape Bridgewater wind farm that was commissioned by Pacific Hydro, I requested permission of the Waubra Foundation to use data collected in the December 2012 survey at Cape Bridgewater to complete a comparative analysis to the data collected and reported upon by Mr Cooper. The Waubra Foundation was supportive of this idea but could provide no funding.[117]

222. In 2013, Mr Huson "undertook independent research to take infrasound measurements inside dwellings surrounding the Macarthur wind farm". As he believed Ms Laurie would be interested, he provided the preliminary findings to her,[118] and he added:

> The Waubra Foundation believed that the preliminary findings would be of assistance to the Tribunal ("VCAT") in their deliberations over the Cherry Tree wind farm and provided funds to allow me to attend the Tribunal and present my preliminary findings.[119]

223. Mr Huson also said in his statement:

> I have been contacted by a number of individuals over acoustic issues that they report are causing health problems. The Waubra Foundation had provided my contact details to those individuals suggesting that I may be of assistance in investigating the particulars of the sound barrier experiencing. The individuals' noise concerns are not limited to sound emissions from wind farms and included sound from coal seam gas extraction, a hospital and the coal industry.[120]

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[114] Transcript, 14 September 2016, p 372 lines 34-35.

[115] Ibid, p 373 line 15.

[116] Exhibit A37, p 3.

[117] Ibid.

[118] Transcript, 14 September 2016, p 374 lines 23-29.

[119] Exhibit A37, p 4.

[120] Ibid, p 4.

224. In his oral evidence he said these individuals included "a resident that was near to a coal processing plant for a coal mine and a family that was located in the middle of a coal seam gas extraction area".[121]

225. In cross-examination, Mr Huson conceded that his experience was that the bulk of the applicant's activities were directed to wind turbines, but said this was not the applicant's sole focus.[122]

226. Mr Steven Cooper is an acoustical consulting engineer. In his statement and oral evidence, he explained that he first met Ms Laurie in 2011 "when I was requested to assess a proposed wind farm at Flyers Creek".[123] He said he met Ms Laurie and other representatives of the applicant at a meeting with the Department of Planning in New South Wales. He said that he wished to get access to some of the homes to conduct measurements and the applicant "facilitated arranging for me to go to a number of houses near the Capital wind farm, the Wood Lawn wind farm and [another] wind farm".[124] He explained that he installed equipment and did monitoring at the houses for which he was given access.[125] His understanding was that the applicant was in touch with these people, having been approached by them in relation to concerns about the wind farms.

227. In his statement, Mr Cooper also acknowledged receiving some funding from the applicant to "assist in travel expenses to Burra in South Australia for initial investigations of the Hallett wind farms for the purpose of obtaining data as part of their research component".[126]

228. In both his statement and oral evidence, Mr Cooper indicated that Ms Laurie and Mr Mitchell from the applicant had told him that the applicant "was interested in undertaking research into low frequency and infrasound as it impacts upon people".[127] In cross-examination, Mr Cooper acknowledged that the applicant mainly interacted with him in

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[121] Transcript, 14 September 2016, p 377 lines 25-27.
[122] Ibid, p 378 lines 8-10.
[123] Ibid, p 408 lines 5-6.
[124] Ibid, p 408 lines 31-33.
[125] Ibid, p 408 lines 46-47.
[126] Exhibit A41, at [18].
[127] Exhibit, at [282].

relation to wind farms, but said "I do know that they looked at other areas, other types of noise, and I've looked at other types of noise with their request".[128] He also said:

> I have been requested by the Waubra Foundation to investigate other industrial noise sources generating low frequency noise, including a coal mine in the Hunter Valley, a recently identified "hum" in Burwood, gas fired power stations and provide advice to other researchers overseas.[129]

229. He also said he became aware from discussions with those representing the applicant that they were "seeking to define what level of low frequency and infrasound that is experienced by people is harmful, by encouraging investigations into what range of sound levels occur" and that they were "encouraging original research into such issues".[130] He stated:

> The Waubra Foundation encouraging research into wind farm noise has facilitated access (for me) to residential properties in proximity to wind farms for the purposes of testing and meeting with residents.
>
> There has been an ongoing technical dialogue with the Waubra Foundation on the outcome of my work (and that of others examining wind farm measurements).[131]

230. Mr Cooper also said that the applicant had introduced him to researchers in other disciplines "to exchange results and findings of various tests".[132] In his oral evidence, Mr Cooper said "I have an ongoing relationship as a result of the Waubra Foundation with some of the world's leading acousticians".[133]

231. Asked to describe his relationship with the Waubra Foundation, he said "[t]hey put me in contact with other researchers, and they've asked for advice, and I've had discussions with them".[134]

Inferences from documents

232. The T-documents provided by the Commissioner comprised some 309 separate documents. The great majority of these are documents which were provided to the ACNC

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[128] Transcript, 14 September 2016, p 451 lines 4-5.

[129] Exhibit A41, at [291].

[130] Ibid, at [285].

[131] Ibid, at [289].

[132] Ibid, at [290].

[133] Transcript, 14 September 2015, p 451 lines 31-32.

[134] Ibid, p 451 lines 43-44.

by the applicant or others in response to the "show cause" letters or in support of its objection to the decision of the Assistant Commissioner. During the hearing, the applicant tendered a Supplementary Book of Evidence containing another 18 documents. However, less than 20 of the 327 documents appear on their face or from other evidence to have been authored or distributed by the applicant in the course of its ordinary activities.[135] Some of the 20 or so documents are in the nature of submissions or promotional material. Counsel for the applicant attached to the outline of his closing submissions a table said to indicate the applicant's activities by reference to nearly all of the 309 documents. However, the evidence does not support counsel's submissions, for example, that the applicant had published many of the documents on its website, or that the applicant had requested or facilitated the production of the documents. In the absence of evidence of this kind, we have found the documents in the T-documents to be of only limited assistance in drawing inferences as to the applicant's activities. However, given the references in other evidence to the applicant's activity in publishing documents on its website, we are prepared to accept that at least several of the documents may have been published in that way.

Findings concerning the applicant's activities

233. On the basis of the evidence outlined earlier, we accept that "the applicant's activities are not confined to the effects of sound and vibration produced by wind turbines", (applicant's objection (a)). However, we find that the greater amount of the applicant's activities do concern wind farms. That is its principal focus.

234. The evidence satisfies us that, whether measured by expenditure of time or money, at the relevant times the applicant engaged in the following activities (in no particular order):

(a) responding to requests for information or references;

(b) responding to and providing practical and sometimes emotional support and assistance to persons who report effects thought to be attributable to noise and, in particular, the sound emissions of wind farms;

[135] T-documents 47, 67, 68, 100, 124, 126, 214, 215, 216, 219, 229, 248, 273, 276, 279, 284, 288.

(c) sourcing, collating and disseminating existing research and other information relating to the perceived (or, as the applicant would have it, actual) physiological and health effects of noise, in particular low frequency noise and infrasound generated by wind turbines;

(d) promoting, organising and, to a limited extent, funding research, including noise testing and trials of acoustic instrumentation—in particular in relation to the sound emissions of wind farms;

(e) advocacy, in particular with respect to the sound emissions or perceived sound emissions of wind farms; and

(f) Fostering a network of, and facilitating communication between, interested/affected residents and between them and researchers, particularly in the context of the sound emissions of wind farms.

235. We also consider that these activities may not be entirely separate and discrete. There may be some overlap, for example, between the activities we have numbered (a), (b), (c) and (f). At a level of generality it may be open to say the applicant's activities were directed to alleviating, mitigating and preventing the *perceived* adverse health effects of sound emissions generated by wind farms. We have used the word "perceived" because the question of whether the sound produced by wind farms does have adverse health effects is controversial.

236. However, identifying the applicant's principal activity is more difficult. The applicant made very little attempt to demonstrate the comparative amount of time, volume of activity or expense spent on each of its activities so as to assist in a determination of its principal activity. Its evidence and submissions seemed to proceed on the basis that all its activities, or at least the great majority of them, should be regarded as an element of one principal activity. Plainly, that is not appropriate.

237. It is pertinent that Ms Laurie herself described the "first priority" of the applicant as attending to the needs of the "sick and desperate people" who contact it and in answering requests for general or specific information. It does not necessarily follow that, because this is the first priority, it is also the most time consuming. The priority ranking may indicate only that this is the task seen as the most urgent or important. However,

Ms Laurie said in respect of the first priority that "most of the time the requests for help are less urgent, and are for general or specific information related to their particular circumstances".[136] Accordingly, we regard the applicant's own categorisation of its first priority as a pointer to it being its principal activity. The very nature of the activity suggests that it would be time consuming.

238. It is not easy to identify the time and resources expended by the applicant in relation to research and awareness raising. It seems reasonable to infer that the time involved in posting information to the website, or in disseminating information by email, would not be great, but no doubt time was taken up in assessing the material appropriate for dissemination. The maintenance of the website alone is likely to be significant.

239. We note again that the applicant's Summary of Expenditure indicated that about 36% of the applicant's expenditure between July 2010 and April 2016 related to "acoustic field research – instrument R&D". If that level of expenditure had pertained during the period relevant to the present proceedings, it may suggest that activities of this kind were of a major kind. However, given the way in which the applicant presented the evidence concerning its finances, we are unable to make that finding. Moreover, having regard to other evidence, it seems to be distinctly possible that at least some of the expenditure incurred under the heading of "Acoustic field research – instrument R&D" was incurred in relation to litigation in which the applicant was assisting others.

240. We accept that there may have been some overlap between the applicant's activities by way of the provision of assistance, on the one hand, and its promotion of research and awareness raising, on the other. Ms Laurie's evidence (quoted earlier in these reasons) to the effect that she considered in detail the complaints and reports of those contacting the applicant with a view to developing an understanding of the field and laboratory research which may be appropriate is pertinent here. We accept that the information derived from those who contacted the applicant for assistance may have facilitated its research/awareness raising activity. However, the applicant has not provided the evidence by which the Tribunal may assess the extent of this activity and its place in the applicant's activities overall.

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[136] Exhibit A7, at [145].

241. We note again the absence of evidence from the applicant of a conventional kind from which inferences as to its activities may be drawn. As we have indicated, such evidence may have included Board agendas, the Board minutes, reports to the Board, guidelines issued by the Board, periodic financial statements and the like.

242. It was for the applicant to prove these matters. It is unfortunate that it has not provided the Tribunal with more evidence on which to base the assessment of its principal activity. Instead, it has left the Tribunal in a state of uncertainty. In that circumstance, we think we should attach significance to Ms Laurie's own description of the applicant's "first priority". As already indicated, that activity seems of its very nature to have been time consuming.

243. Accordingly, we conclude that the applicant's principal activity is that of responding to requests for assistance. Some of these requests were from people expressing desperation and others who simply wanted access to research and information. While we accept that the promotion and facilitation of research, the dissemination of the results of research, and awareness raising are significant aspects of the applicant's activities, we are not satisfied that they comprise its principal activity. If responding to requests for assistance had occupied a smaller proportion of the applicant's time and resources, there may have been a live issue as to whether the balance of the applicant's activities, or some combination of them, could have been seen to promote the prevention and control of diseases, and whether that sub-set of activities could also have been characterised as its principal activity. However, on the evidence before us, we have concluded that the activity of responding to requests for assistance occupied such a substantial proportion of the applicant's time and resources that it is not tenable to characterise any of its other activities, or any combination of those activities, as its principal activity.

244. This is an important finding and, as will be seen, means that the application insofar as it concerns Item 13 must fail. Before explaining why that is so, however, we will address the expert evidence adduced at the hearing.

THE SCIENTIFIC AND MEDICAL EVIDENCE

245. The Tribunal received written and oral evidence from a number of scientific and medical experts from a range of disciplines. In the event, a large measure of consensus emerged with respect to the critical issues of sleep disturbance and annoyance which were very much at the heart of the applicant's case.

246. Almost all of the expert evidence is consistent with two propositions: first, that sound emissions from wind farms are associated with sleep disturbance and annoyance; and secondly, that there is no established association between wind farm sound emissions and direct physiological changes/adverse health effects.

247. Before discussing that evidence however, we explain some of the technical concepts and nomenclature deployed by the experts which we have adopted in these reasons.

Concepts and Nomenclature

"Sound" and "noise"

248. The following helpful explanations are contained in the publication "Systematic review of the human health effects of wind farms" by the University of Adelaide (Systematic Review), commissioned by the National Health and Medical Research Council and published in 2013 (to which we will return shortly):

> Noise is defined as an unwanted sound or an unwanted combination of sounds. Therefore, what can be considered 'noise' will vary between individuals depending on factors such as the complex temporal pattern and intensity of the sound, cultural attitudes, timing and other circumstances (e.g. a Beethoven symphony may be music at dinner time but noise in the middle of the night if it disrupts sleep).
>
> Sound is an energy form that travels from a source in the form of waves or pressure fluctuations transmitted through a medium and received by a receiver (e.g. human ear). Sound is perceived and recognised by its loudness (pressure and pitch frequency) [Frequency is the number of sound waves/cycles passing a given point per second and is measured is (sic) cycles per second (cps), also called hertz (Hz)]. The general range for human hearing for young adults is between 20 Hz and 20 kHz, with a declining upper limit as age increases … Human sound perception is less sensitive to lower frequency (low pitch) and higher frequency (high pitch) sounds. It is easiest for the human ear to recognise sounds in the middle of the audible spectrum (1-4 kHz). …
>
> The following sound thresholds have been suggested …
>
> - Infrasound, <20 Hz (normally inaudible)
> - Low-frequency, 20-200 Hz, although the upper limit can vary …
> - Mid-frequency, 200-2000 Hz
> - High-frequency, 2-10 kHz.[137]

[137] Exhibit A4, T130/1994; "Systematic review of the human health effects of wind farms", The University of Adelaide, National Health and Medical Research Council, 2013, p 59; referencing Berglund, Hassmen & Job 1996; and Roberts & Roberts 2009.

249. Mr Christopher Turnbull, an acoustic engineer called to give evidence at the request of the Commissioner, gave the following explanation in his report. As we understand it, this is consistent with the evidence and opinions of the other acoustic experts:

> A way of "picturing" sound is to think of the surface of a drum. When the drum surface is hit, it vibrates up and down. As the drum surface moves up, a high pressure wave is produced. As it moves down, a lower pressure wave is produced. These peaks and troughs of pressure difference move spherically away from the drum surface through air at the speed of sound in a similar way to the high and low parts of a wave move through the ocean. The number of "waves" that pass a point in a period of time is known as the "frequency" and this defines the "pitch" of the sound that is perceived.
>
> Low frequency sounds such as bass drums and distant thunder have a smaller number of waves per second. High frequency sounds such as whistles and birdsong have a higher number of waves per sound. The human ear detects both the frequency of the sound and the pressure that has been created. In general terms, a higher frequency sound is perceived as having a higher "pitch" and a sound with a higher pressure level is perceived to be louder.
>
> The human ear can detect an enormous range of frequencies and pressure levels. The lower limit of audibility (the audibility threshold or the threshold of hearing) is different for different frequencies with the best human hearing at the frequencies used for speech. [138]

Measurement of sound

250. The Systematic Review also explained that:

> The decibel (dB) is an indicator of loudness (amplitude) calculated as the logarithmic ratio of sound pressure level (SPL).
>
> …
>
> Various filters … can be used to weight sound pressure measurements as a function of frequency to align them with human sensitivity. The human ear simultaneously receives sound at many frequencies and at different amplitudes. The audibility of the sound varies significantly with the frequency of the sound it is receiving, in addition to the SPL of that sound. At low SPLs, low frequencies are less audible than medium frequencies … . The standardised frequency weighting filters are depicted in Figure 2.

[138] Exhibit R45, Report of Mr CP Turnbull dated 27 May 2016, p 2.

Figure 2 Standardised frequency weighting curves

(Source: Figure 1.3.7, Jacobsen et al. (2011) [139]

> The A-weighted SPL is the most widely used single-value measure of sound. A-weighted measurements are common because they generally align with the subjective response to noise. However, the A-weighted filter is 'less sensitive' to very-high- and very-low-frequency sound. The C-weighted filter is essentially 'flat' in the audible frequency range, but is 'more sensitive' in the low-frequency range than the A-weighted filter. Therefore, a large difference between the A-weighted level and the C-weighted level is a clear indication of prominent content of low-frequency noise … B-weighted and D-weighted filters are not often used.
>
> The G-weighting function is used to quantify sound that has a significant portion of its energy in the infrasonic range. The function weights noise levels between 0.25 Hz and 315 Hz to reflect human perception of infrasonic noise levels … The weighting … is applied directly to the unweighted noise levels. The perception of sound in the infrasonic range is greatest at 20 Hz, with a reduction as the frequency decreases.[140]

251. Mr Turnbull's explanation is similar:

> The decibel scale enables a meaningful description and analysis of such a large range of levels and is therefore used to represent sound level. Over time, frequency "weightings" have been developed to assist in simulating the human response to different frequencies. For example, in general terms, a high frequency sound is perceived to be louder than a low frequency sound at the same pressure level. Therefore, weighting networks make this adjustment to simulate perception.
>
> The A weighting scale, where sound levels are presented as dB(A), represents the response of the human ear. Other scales have been developed to represent human perception to specific parts of the frequency spectrum or to emphasise specific parts of the spectrum.[141]

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[139] Exhibit A4, T130/1994-1995; referencing Roberts & Roberts 2009, Rogers, Manwell and Wright 2006; and Jacobsen et al. 2011.

[140] Exhibit R56, p 60; referencing Jacobsen et al. 2011; and Verrotti et al. 2005.

[141] Exhibit R45, p 2.

252. As we understand it, while every 6 dB SPL increase represents a doubling of amplitude, approximately every 10 dB increase will result in a doubling of perceived loudness.[142]

Sound perception and distance

253. The Systematic Review also includes the following explanation:

> Due to the predictable decrease in sound pressure with increasing distance from a source, it is possible to use distance as a proxy for SPL measures. It should be noted, however, that, in addition to distance from the source, wind direction, terrain, temperature and time of day can affect sound levels. Another characteristic of sound is that longer wavelengths (low-frequency) travel further through most media (e.g. air, water) than shorter wavelengths, and generally show less attenuation than shorter wavelengths when travelling through solid media such as walls and windows … This characteristic is relevant to the consideration of sound produced by wind turbines, given that residences are usually at a distance from turbines.[143]

254. Similarly, Mr Turnbull explains:

> Sound reduces over distance due to a range of factors including atmospheric absorption. The mid and high frequencies are subject to a greater rate of atmospheric absorption compared to the low frequencies and therefore over large distances, whilst the absolute level of sound in all frequencies reduces, the relative level of low frequency sound compared to the mid and high frequency content increases.[144]

255. As to the audibility of infrasound, Mr Turnbull stated:

> A common audibility threshold from the range of studies is an infrasound sound level of 85 dB(G) or greater. The audibility threshold limit of 85 dB(G) is consistent with other European standards and studies …[145]

256. Before proceeding to discuss the evidence of the various experts who gave oral evidence during the hearing, it is convenient to refer to a number of studies and articles which loomed large in the evidence of the experts and which, in some cases, formed part of the basis for their opinions.

Relevant studies, articles and other publications

257. The parties provided a considerable volume of material bearing on the issue of whether wind turbines are associated with adverse impacts on human health. It is not practical in

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[142] Exhibit A47, p 3.

[143] Exhibit A4, T130/1996; referencing Persson Waye 2004.

[144] Exhibit R45, p 5.

[145] Ibid, p 3.

these reasons to refer to all the material. We have, however, reviewed and considered all of the material to which the parties referred the Tribunal.

258. We will first refer to the Systematic Review itself before turning to other articles and studies which featured prominently in the oral evidence, or which we have identified as having particular relevance to the issues of sleep disturbance and annoyance.

The Systematic Review

259. In 2012, the National Health and Medical Research Council (the NHMRC) commissioned a systematic review by members of the University of Adelaide of the literature concerning the association between exposure to wind farms and health effects on humans. The result was a report provided to the NHMRC to which the parties referred as "the Systematic Review".

260. The Systematic Review considered a large amount of literature. However, of the 2,850 potentially relevant references it identified, only 11 articles met the pre-specified eligibility criteria.[146] The conclusions of the Review are therefore based on a small fraction of the overall literature.

261. The Systematic Review concluded as follows with respect to "Direct Evidence":

> In summary, the systematic review indicated that there was no consistent evidence that noise from wind turbines, whether estimated in models or using distance as a proxy, is associated with self-reported human health effects. The quality and quantity of the available evidence was limited.
>
> Proximity to wind turbines or estimated SPL[147] was associated with annoyance, and often associated with sleep disturbance and poorer quality of life. However, it cannot be ruled out that bias or confounding is an explanation for these associations.[148]

262. With respect to "Mechanistic and Parallel Evidence", the Review concluded:

> Mid-to high frequency noise from wind turbines is unlikely to be significant at normal residential distances from wind turbines. ILFN[149] from wind turbines is possible but difficult to isolate over the levels of background infrasound that are commonly present in the environment (e.g. wind noise in rural environments). The mechanism by which ILFN could cause adverse health effects is not clear and the available parallel laboratory evidence was

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[146] Exhibit A4, T130/1946.

[147] Sound pressure level.

[148] Exhibit A4, T130/1952.

[149] Infrasound/low frequency noise.

> inconclusive with regard to the effect on intermediate physiological outcomes as findings were inconsistent within and between studies.[150]

263. With respect to "Evidence for Causation", the Systematic Review concluded as follows:

> The reported effects in the studies did occur near wind turbines (spatial proximity). However, with the exception of annoyance, sleep quality or sleep disturbance and quality of life—the latter of which are possibly related to health—there was no consistent association between adverse health effects and estimated noise from wind turbines. … From these data, no dose-response relationship was observed between estimated sound pressure level or distance from a wind turbine and the direct health effects examined.
>
> A dose-response relationship was apparent between wind turbine proximity and the possibly health related effects of sleep disturbance, poor sleep quality and quality of life; these effects were less common as the estimated SPL reduced or distance from the wind turbines increased. However, there is a possibility that the associations with sleep quality, sleep disturbance and quality of life are confounded by annoyance and other factors that determine it. Evidence of reversibility was present in one small study. Participants in this study recalled less sleep disturbance when they were away from wind turbines. The participants knew that the purpose of the study was to investigate wind turbine noise.
>
> … A mechanism by which ILFN could harm human health could not be determined. There was no consistent association observed between ILFN and intermediate physiologic effects (e.g. blood pressure) in the laboratory setting. Health outcomes were not measured.
>
> The quality and quantity of evidence available to address the questions posed in this review was limited. The evidence considered does not support the conclusion that wind turbines have direct adverse effects on human health, as the criteria for causation have not been fulfilled. Indirect effects of wind farms on human health through sleep disturbance, reduced sleep quality, quality of life and perhaps annoyance are possible. Bias and confounding could, however, be possible explanations for the reported associations upon which this conclusion is based.[151]

264. For present purposes, it is pertinent that the Systematic Review acknowledged a "possible" relationship between wind farm noise and adverse health effects, mediated by sleep disturbance and "perhaps" annoyance.

265. An Information Paper based on the Systematic Review was published by the NHMRC in February 2015. With respect to "Annoyance", the Information Paper said:

> There is consistent but poor quality direct evidence that wind farm noise is associated with annoyance. Bias of different kinds and confounding factors are possible explanations for the associations observed. While the parallel evidence suggests that prolonged noise-related annoyance may result in stress, which may be a risk factor for cardiovascular disease, annoyance was not consistently defined in the studies and a range of other factors may have contributed to its reported association with wind farm noise.[152]

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[150] Exhibit A4, T130/1952.

[151] Ibid, T130/1952-1953.

[152] Ibid, T300/6269; "Information Paper : Evidence on Wind Farms and Human Health", National Health and Medical Research Council (Cth) (2015).

266. With respect to sleep disturbance, the NHMRC also stated:

> There is less consistent, poor quality direct evidence of an association between sleep disturbance and wind farm noise. However, sleep disturbance was not objectively measured in the studies and a range of other factors are possible explanations for the association observed. While chronic sleep disturbance is known to affect health, the parallel evidence suggests that wind farm noise is unlikely to disturb sleep at distances of more than 1,500m from wind farms.
>
> …
>
> Given these reported experiences and the limited reliable evidence, NHMRC considers that further, higher quality, research is warranted. NHMRC will issue a Targeted Call for Research into wind farms and human health to encourage Australia's best researchers to undertake independent, high quality research investigating possible health effects and their causes, particularly within 1,500m from a wind farm.[153]

267. In March 2016, the NHMRC awarded two grants totalling $3.3 million "to enrich the evidence-based understanding of the effects of wind farms on human health". In relation to these grants, the NHMRC CEO, Professor Anne Kelso, said:

> further research is needed to explore the relationships between wind farms and human health.
>
> Existing research in this area is of poor quality and targeted funding is warranted to support high quality, independent research on this issue.
>
> To address this, we need well designed studies conducted by excellent researchers in Australian conditions.
>
> These grants directly support the Australian Government's commitment to determine any actual or potential effects of wind farms.[154]

268. A systematic review of the literature using different criteria was also undertaken in 2014 by researchers in Denmark and published in December 2014 in the journal PLOS One. The conclusions of that review were different from those of the NHMRC Systematic Review. The authors concluded:

> Noise from wind turbines results in significant annoyance for neighbours of wind turbines, and the level of annoyance is related to the A-weighted sound exposure … It has been shown that the sound exposure from wind turbine noise increases noise annoyance by dose-responsive degrees, and this annoyance may be the primary mediating agent causing sleep disturbance and increased psychological distress … On the other hand, it is also possible that sleep disturbance may lead to increased annoyance. Self-reported sleep disturbance was found to be significantly related to the given sound exposure and more frequently reported from subjects living closer to wind turbines compared to subjects living further away…
>
> …

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[153] Exhibit A29, T66;, "NHMRC Statement : Evidence on Wind Farms and Human Health", National Health and Medical Research Council (2015) ref # EH 57, at [5].

[154] Ibid; "NHMRC awards funding into wind farms and human health", National Health and Medical Research Council Media Release 22 March (2015).

> Virtually all of the studies did point toward an association between wind turbine exposure and annoyance or sleep disturbance; however, one of the significant limitations of these cross-sectional studies is their inherent inability to evidence a clear causal relationship between exposure to wind turbines and health-related outcomes. It is therefore not known with certainty if the association between wind turbine exposure and health-related outcomes is caused by sound exposure, visual disturbance, economic aspects or something else. Cross-sectional studies are simply more explorative by nature.[155]

269. The authors also stated:

> At present it seems reasonable to conclude that noise from wind turbines increases the risk of annoyance and disturbed sleep in exposed subjects in a dose-response relationship. There seems to be a tolerable limit of around L_{Aeq} of 35 dB. … Furthermore, there is an indication that noise annoyance and sleep disturbance are related and that disturbed sleep potentially can lead to adverse health effects.[156]

The Health Canada study

270. As already mentioned, the evidence included excerpts from a report of a study by Health Canada. The effect of much of the expert evidence was that this is the largest and most authoritative study to date examining the relationship between wind farm emissions and human health. The background to the study is explained as follows:

> In July 2012, Health Canada announced its intention to undertake a large scale epidemiology study in collaboration with Statistics Canada. The study was launched to support a broader evidence base on which to provide federal advice and an acknowledgement of the community health concerns expressed in relation to wind turbines.[157]

271. As to the methodology of the study, the report explains that:

> The study was undertaken in two Canadian provinces, Ontario (ON) and Prince Edward Island (PEI), where there were a sufficient number of homes within the vicinity of wind turbine installations. The study consisted of three primary components: an in-person questionnaire, administered by Statistic Canada to randomly selected participants living at varying distances from wind turbine installations; collection of objectively measured outcomes that assess hair cortisol, blood pressure and sleep quality; and, more than 4000 hours of [Wind Turbine Noise (WTN)] measurements conducted by Health Canada to support the calculation of WTN levels at residences captured in the study scope. To support the assessment and reporting of data, and permit comparisons to other studies, residences were grouped into different categories of calculated outdoor A-weighted WTN levels as follows: less than 25dB; 25-<30dB; 30-<35dB; 35-<40dB; and greater than or equal to 40 dB.[158]

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[155] Ibid, T89/19-20; Schmidt JH and Klokker M "Health Effects Related to Wind Turbine Noise Exposure: A Systematic Review, PLOS One (2014), Abstract (citations omitted).

[156] Ibid, T89/22.

[157] Exhibit R44/1; Health Canada, "Environmental and Workplace Health" – Wind Turbine Noise and Health Study: Summary of Results, Background and Rationale (citations omitted).

[158] Exhibit R44; Research Objectives and Methodology, p 1.

272. With respect to the self-reported questionnaire results, the preliminary research findings of the Health Canada study were:

> The following were not found to be associated with WTN exposure:
>
> - Self-reported sleep (e.g., general disturbance, use of sleep medication, diagnosed sleep disorders);
> - self-reported illnesses (e.g., dizziness, tinnitus, prevalence of frequent migraines and headaches) and chronic health conditions (e.g., heart disease, high blood pressure and diabetes); and
> - self-reported perceived stress and quality of life.[159]

However:

> The following was found to be statistically associated with increasing levels of WTN:
>
> - annoyance towards several wind turbine features (i.e. noise, shadow flicker, blinking lights, vibrations and visual impacts).[160]

273. The Health Canada study reported:

> Statistically significant exposure–response relationships were found between increasing WTN levels and the prevalence of reporting high annoyance. These associations were found with annoyance due to noise, vibrations, blinking lights, shadow and visual impacts from wind turbines. In all cases, annoyance increased with increasing exposure to WTN levels.[161]

274. The study also reported that a statistically significant increase in annoyance was found when WTN levels exceeded 35 dB(A), and reported WTN annoyance was statistically higher in the summer, outdoors and during evening and night time. Further, "WTN annoyance significantly dropped in areas where calculated nightime background noise exceeded WTN by 10 dB or more".[162] The study also noted:

> - Annoyance was significantly lower among the 110 participants who received personal benefit, which could include rent, payments or other indirect benefits of having wind turbines in the area e.g., community improvements. However, there were other factors that were found to be more strongly associated with annoyance, such as the visual appearance, concern for physical safety due to the presence of wind turbines and reporting to be sensitive to noise in general.[163]

275. Significantly, the Health Canada study reported the following:

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[159] Ibid; B. Self-Reported Questionnaire Results, p 2.

[160] Ibid; 4. Quality of Life, p 3.

[161] Ibid; 5.2 Community Annoyance Findings, p 4.

[162] Ibid; 5.2 Community Annoyance Findings, p 4.

[163] Ibid.

- WTN annoyance was found to be statistically related to several self-reported health effects including, but not limited to, blood pressure, migraines, tinnitus, dizziness, scores on the PSQI, and perceived stress.
- WTN annoyance was found to be statistically related to measured hair cortisol, systolic and diastolic blood pressure.
- The above associations for self-reported and measured health endpoints were not dependent on the particular levels of noise, or particular distances from the turbines, and were also observed in many cases for road traffic noise annoyance.
- Although Health Canada has no way of knowing whether these conditions may have either pre-dated, and/or are possibly exacerbated by, exposure to wind turbines, the findings support a potential link between long term high annoyance and health.
- Findings suggest that health and well-being effects may be partially related to activities that influence community annoyance, over and above exposure to wind turbines.[164]

276. With respect to the objectively measured results, the study reported "[o]bjectively measured health outcomes were found to be consistent and statistically related to corresponding self-reported results. WTN was not observed to be related to hair cortisol concentrations, blood pressure, resting heart rate or measured sleep".[165]

277. However, the Health Canada study reported that WTN noise was associated with high annoyance, and that high annoyance was associated with adverse health effects. This suggests that while there was not found to be a direct relationship between exposure to WTN and adverse health effects across the population studied, there may have been a connection between WTN and adverse health effects in some individuals, possibly mediated by annoyance. In other words, the results appear to be consistent with the proposition that annoyance increases with increasing WTN, and those annoyed are more likely to suffer adverse health effects. It would appear that those in a given population who are more susceptible to annoyance may be more vulnerable to suffering adverse health effects as a result of WTN. We acknowledge that there may be other explanations for these results, for example that those in a poorer state of health are more susceptible to annoyance.

278. As we will go on to explain, it is relevant to note that the correlation examined by the Health Canada study was between adverse health impacts and noise measured by reference to the A-weighting system. Accordingly, the study does not exclude a possible

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[164] Ibid; 5.3 Annoyance and Health, pp 4-5.

[165] Ibid; C. Objectively Measured Results, p 5.

association between wind farm emissions and adverse health effects, if the emissions are measured in a different way.

279. The summary provided by Health Canada acknowledged that C-weighted noise measurements may be more appropriate for measuring low frequency noise. The summary made mention of the following matters relevant to measuring the sound emissions of wind farms:

1. A-Weighted

   More than 4000 hours of WTN measurements conducted by Health Canada supported the calculations of A-weighted WTN levels at all 1238 homes captured in the study sample.

   - Calculated outdoor A-weighted WTN levels for the homes participating in the study reached 46 dBA for wind speeds of 8m/s. This approach is the most appropriate to quantify the potential adverse effects of WTN. The calculated WTN levels are likely to be representative of yearly averages with an uncertainty of about +/- 5dB and therefore can be compared to World Health Organization (WHO) guidelines. The WHO identifies an annual outdoor night time average of 40 dBA as the level below which no health effects associated with sleep disturbance are expected to occur even among the most vulnerable people (WHO (2009) Night Noise Guidelines for Europe).

2. Low Frequency Noise

   Wind turbines emit LFN, which can enter the home with little or no reduction in energy potentially resulting in rattles in lightweight structures and annoyance. Although the limits of LFN are not fixed, it generally includes frequencies from between 20 Hz and 200 Hz. C-weighted sound levels can be a better indicator of LFN in comparison to A-weighted levels, and were calculated in order to assess the potential LFN impacts.

   - Calculated outdoor dBC levels for homes ranged from 24 dBC and reached 63 dBC.

     …

   - No additional benefit was observed in assessing LFN because C- and A-weighted levels were so highly correlated (r=0.94) that they essentially provided the same information. It was therefore not surprising that the relationship between annoyance and WTN levels was predicted with equal strength using dBC or dBA and that there was no association found between dBC levels and any of the self-reported illnesses or chronic health conditions assessed (e.g., migraines, tinnitus, high blood pressure etc.).

     …

3. Infrasound

   Long-term measurements over a period of 1 year were also conducted in relation to infrasound levels.

- Infrasound from wind turbines could sometimes be measured at distances up to 10km from the wind turbines, but was in many cases below background infrasound levels.[166]

280. Some of the methodology adopted in the Health Canada study was explained in an article entitled "Self-reported and objectively measured health indicators among a sample of Canadians living within the vicinity of industrial wind turbines: social survey and sound level modelling methodology".[167] This article was authored by 20 authors who came from a variety of disciplines. The article explained the modelling used, including details of the topography and meteorology used in the modelling, and the use of wind turbine sound (WTS) power levels.

281. With respect to the means by which WTS was measured, the authors explained:

> Sound measurements are made 75m to 130m from the base of the turbines (depending on their size) to verify the available sound power level data, and to extend this data down to 6.3 Hz. Using the same instrumentation, additional sound measurements are made at distances up to 5 km from the wind turbines to verify the sound propagation algorithms used for long distances.
>
> To allow a verification of the indoor WTS exposure, the difference in level from outdoors to indoors is measured at a sample of homes.[168]
>
> …
>
> Similar measurements to those used for the determination of WTS power levels are made at distances up to 5km to support sound propagation models. The identification of WTS uses identifiable features in the measured signal, such as harmonics, amplitude, modulation and unique spectral shape that are in some cases identified by turning the turbine on and off.[169]

282. With respect to infrasound measurements, the authors explained that:

> Infrasound propagation is validated by measurements similar to the method used for source sound power and sound propagation. … Measurements are also made during scheduled shutdowns. … The WTS signal has a fundamental around 0.4 to 0.9 Hz with a number of harmonics at higher frequencies. In some cases these harmonics are readily measured at distances up to 10 km and confirmed to originate from wind turbines by comparing to operational data logs. However, on many occasions, the measured signal is overwhelmed by local ambient sound.[170]

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[166] Ibid, D. Wind Turbine Noise Measures Results, p 6.

[167] Ibid, p 14 (emphasis altered).

[168] Ibid; WTS Measurements, p 19.

[169] Ibid; Source sound power and sound propagation measurements, p 19.

[170] Ibid; Infrasound measurements, p 20.

Health Canada 2015 Paper

283. In a paper presented at the 6th International Meeting on Wind Turbine Noise in Glasgow, in April 2015, Dr David Michaud of Health Canada acknowledged that the limitations applying to the Health Canada study included:

- results may not be generalized to areas beyond the sample as the wind turbine locations in this study were not randomly selected from all possible sites operating in Canada;
- results do not permit any conclusions about causality; and
- results should be considered in the context of all published peer-reviewed literature on the subject.[171]

284. Dr Michaud said that, at the highest WTN levels (40-46 dB(A) in both Provinces), 16.5% of respondents were highly annoyed in Ontario and 6.3% on Prince Edward Island.[172] Further, assessed as a function of distance, annoyance was observed to drop at distances between one to two kilometres in Ontario, compared with Prince Edward Island at which "almost all of the participants who were highly annoyed by WTN lived within 550m of a wind turbine".[173]

285. Dr Michaud also recorded that WTN annoyance was "statistically high in the summer, outdoors and during evening and night time ...".[174] Further, "WTN annoyance significantly dropped in areas where calculated night-time background noise exceeded WTN by 10 dB or more …".[175] He also reported:

> While it was found that many variables had a significant impact on measured sleep, calculated outdoor WTN levels near the participants' dwelling was not found to be associated with any of the sleep endpoints measured with actigraphy …".[176]

286. We note that this conclusion related only to calculated rather than measured WTN levels and was restricted to outdoors.

287. Dr Michaud reported in the paper:

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[171] Exhibit A29, T57/9; Michaud S, "Wind Turbine "Noise and Health Study: Summary of Results", 6th International Meeting on Wind Turbine Noise, Glasgow 20-13 April (2015).

[172] This is also consistent with other studies – see Exhibit A29, T132; Waye KP University of Gothenburg "Wind turbine noise – still a health issue?"

[173] Ibid, T57/12; Michaud S, "Wind Turbine "Noise and Health Study: Summary of Results"

[174] Ibid, T57/13.

[175] Ibid.

[176] Ibid, T57/18.

> The overall conclusion to emerge from the study findings is that the study found no evidence of an association between exposure to WTN and the prevalence of self-reported or measured health effects beyond annoyance. Collectively, the findings related to annoyance suggest that health and well-being effects may be partially related to activities that influence community annoyance, over and above exposure to WTN. Therefore, efforts that aim to identify and mitigate high levels of annoyance with wind turbines may have benefits that go beyond annoyance.[177]

288. We add that the results of the study appear to be consistent with the proposition advanced by others that those benefiting from the presence of wind turbines experience less annoyance and consequently less adverse health effects than those not benefiting personally from the presence of wind turbines.

Further references to the Health Canada study

289. In their "Introductory remarks for special issue on wind turbine noise", published in the *Journal of the Acoustical Society* in March 2016, the authors noted that:

> Most notably, cross-sectional studies cannot establish causal relationships, nor can the Health Canada study be used to make inferences about the presence of health effects that may occur at very low prevalence rates.
>
> …
>
> Beyond annoyance, the Health Canada study indirectly suggests that if health effects do exist, they would occur at very low prevalence rates, and that future work in this area could benefit from carefully executed case-control studies in addition to longitudinal studies.[178]

290. The authors also commented on the use by Health Canada of both A- and C-weighted metrics, commenting that:

> Although A-weighted noise metrics may correlate with community responses to wind turbine noise, this does not necessarily make them the preferred metrics for use in this application. Indeed, the statistical association between A-weighted WTN levels and annoyance in the Health Canada study was especially weak: the base model accounted for only about 9% of the variance when only WTN noise levels were considered. The strength of the model only increased to 58% after other "non-A-weighted" variables were added.[179]

291. There are a number of other studies which have shown or suggest the existence of an association between wind turbine sound exposure and sleep interruption.[180] Many

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[177] Ibid, T57/18.

[178] Ibid, T90/1430.

[179] Ibid, T90; Schomer P and Fidell S "Introductory remarks for special issue on wind turbine noise" J.Acoust. Soc. Am. 138 (3) (March 2016), at [3] and [9].

[180] Ibid; T132; Waye KP University of Gothenburg "Wind turbine noise – still a health issue?"

researchers have commented that in order to assess properly the likelihood of adverse health impacts beyond annoyance and sleep disruption, longitudinal studies are required.

292. In 2015, one academic observed that to date there had only been cross-sectional studies with methodological limitations for considering health impacts other than annoyance. He observed that further studies were required with better control of confounding factors and larger sample sizes to provide better knowledge of whether sleep disturbance or stress can be an effect of wind turbine exposure.[181]

Medical recognition of adverse health effects from wind farms

293. There is a degree of recognition in some of the medical literature that proximity to wind farms is associated with adverse health effects.

294. In particular, an article published in the *Journal of the Royal Society for Medicine* in 2014 proposed the following diagnostic criteria for a probable diagnosis of "adverse health effects in the environs of wind turbines":

> First-order criteria (all four of the following must be present)
>
> (a) Domicile within up to 10 km from IWT [Industrial Wind Turbines] … [182]
>
> (b) Altered health status following the start-up of, or initial exposure to, and during the operation of IWT. There may be a latent period of up to six months.
>
> (c) Amelioration of symptoms when more than 10 km from the environs of IWT.
>
> (d) Recurrence of symptoms upon return to environs of IWT.
>
> Second-order criteria (at least three of the following occur or worsen after the initiation of operation of IWT)
>
> (a) Compromise of quality of life.
>
> (b) Continuing sleep disturbance, difficulty initiating sleep and/or difficulty with sleep disruption.
>
> (c) Annoyance producing increased levels of stress and/or psychological distress.
>
> (d) Preference to leave residence temporarily or permanently for sleep and/or restoration.

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[181] Ibid.

[182] Exhibit A4, T127/1917; Author's note: "The premise of considering effects up to 10 km is the result of adverse event reports up to 10 km and Health Canada's announcement of February 10, 2013 that regarding the Wind Turbine Noise and Health Study, noise measurements at residences will be made at distances up to 10 km from the wind turbines. See http://www.hc-sc.gc.ca/ewh-semt/consult/_2013/wind_turbine-eoliennes/research_recherche-eng.php (last checked 17 March 2014)".

Third-order criteria

Three or more of the following frequently occur or worsen following the initiation of IWT. If the symptoms described in second-order criteria ((b) and (c)) are present, no further symptoms or complaints are required for the probable diagnosis. Based on the authors' experience,[183] the following list provides an indication of the more common symptoms:

Neurological
(a) Tinnitus
(b) Dizziness
(c) Difficulties with balance
(d) Ear ache
(e) Nausea
(f) Headache

Cognitive
(a) Difficulty in concentrating
(b) Problems with recall or difficulties with recall

Cardiovascular
(a) Hypertension
(b) Palpitations
(c) Enlarges heart (cardiomegaly)

Psychological
(a) Mood disorder, i.e. depression and anxiety
(b) Frustration
(c) Feelings of distress
(d) Anger

Regulatory disorders
(a) Difficulty in diabetes control
(b) Onset of thyroid disorders or difficulty controlling hypo- or hyper-thyroidism

Systemic
(a) Fatigue
(b) Sleepiness.[184]

295. In the same article it was suggested that a diagnosis could be confirmed by the following methods:

- Simultaneous monitoring of physiological parameters, i.e. a sleep study as well as noise energy exposure which ideally should be done in the home of both affected and unaffected individuals with simultaneous recording of sound energy inside and outside the home while capturing all frequencies including decibel and infra- and low-frequency noise and sound pressure levels.
- Blinding of the exposed individuals to control for visual impact is accomplished by testing during sleep.
- For sleep disturbance, measurements electro-physiologically and by biomarkers.[185]

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[183] Ibid, T127/1918; Krogh CME, Gillis L, Kouwen N and Aramini J. Wind VOiCe, a self-reporting survey: adverse health effects, industrial wind turbines, and the need for vigilance monitoring (2011) Bull Sci Technol Soc (31) 334.

[184] Ibid, T127/1917; McMurtry RY. Toward a case definition of adverse health effects in the environs of industrial wind turbines: facilitating a clinical diagnosis (2011) Bull of Sci Technol & Soc (31) 316.

Other relevant articles and publications

296. The Night Noise Guidelines for Europe (The Night Noise Guidelines) were developed in 2006 by a working group of experts established by the World Health Organization in relation to the assessment and control of night noise exposure. The Night Noise Guidelines contain the following summary of the relationship between night noise exposure, on the one hand, and health effects, on the other, suggested by a "systematic review of evidence produced by epidemiological and experimental studies":

Table 5.4 Effects of different levels of night noise on the population's health

Average night noise level over a year $L_{night, outside}$	**Health effects observed in the population**
Up to 30 dB	Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. $L_{night, outside}$ of 30 dB is equivalent to the NOEL [No observed effect level] for night noise.
30 to 40 dB	A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. $L_{night, outside}$ of 40 dB is equivalent to the LOAEL [Lowest observed adverse effect level] for night noise.
40 to 55 dB	Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.
Above 55 dB	The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.[186]

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[185] Ibid, T127/1917-1918; World Health Organization, Burden of Disease From Environmental Noise: Executive Summary (2011) Geneva: World Health Organization (Xv); Moller-Levet CS, Archer SN, Bucca G, Laing EE, Slak A and Kabiljo R, et al. Effects of insufficient sleep on circadian rhythmicity and expression amplitude of the human blood transcriptome (2013) Proc Natl Acad Sci (110) E1132-E1141 (citations omitted).

[186] Ibid, T211/3028; noting "$L_{night, outside}$ … is the night-time noise indicator (L_{night}) of Directive 2002/49/EC of 25 June 2002: the A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the night periods of a year; in which: the night is eight hours (usually 23.00 – 07.00 local time), a year is a relevant year as regards the emission of sound and an average year as regards the meteorological circumstances, the incident sound is considered, the assessment point is the same as for L_{den}. See Official Journal of the European Communities, 18.7.2002, for more details".

297. The material before us includes a number of articles which explore the adverse effects of noise on health more generally. In an article published in The Lancet entitled "Auditory and Non-auditory Effects of Noise on Health" it was reported that:

> The most investigated non-auditory health endpoints for noise exposure are perceived disturbance and annoyance, cognitive impairment (mainly in children), sleep disturbance, and cardiovascular health. WHO estimates that in high-income western European countries (population about 340 million people), at least 1 million healthy life-years (disability-adjusted life years) are lost every year because of environmental noise.[187]

298. With respect to more specific impacts, the authors also reported that:

> Both short-term laboratory studies of human beings and long-term studies of animals have provided biological mechanisms and plausibility for the theory that long-term exposure to environmental noise affects the cardiovascular system and causes manifest diseases (including hypertension, ischaemic heart diseases, and stroke).[188]

299. The authors also commented:

> Because of different acoustic characteristics for different noise sources (sound level, frequency spectrum, time course, sound level rise time, and psychoacoustic measures) noise levels from different noise sources cannot be merged into one indicator of decibels. Different exposure-response curves are needed for different noise sources.[189]

300. Included in the article were exposure-response curves of road and aircraft noise and cardiovascular end points, showing rates of hypertension, myocardial infarction and stroke.

301. A study carried out by Michael A Nissenbaum et al and reported in the article "Effects of Industrial Wind Turbine Noise on Sleep and Health" published in 2012 showed as follows:

> Participants living within 1.4 km of an IWT had worse sleep, were sleepier during the day, and had worse SF36 Mental Component Scores compared to those living further than 1.4 km away. Significant dose-response relationships between PSQI, ESS, SF36 Mental Component Score, and log-distance to the nearest IWT were identified after controlling for gender, age, and household clustering. The adverse event reports of sleep disturbance and ill health by those living close to IWTs are supported.[190]

302. A later article published in 2015 and entitled "The effect of wind turbine noise on sleep and quality of life : A systematic review and meta-analysis of observational studies" using data

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[187] Ibid, T9/4; Basner M, Babisch W, Davis A, Brink M, Clark C, Janssen S and Stansfeld S "Auditory and non-auditory effects of noise on health" www.thelancet.com Published online October 30, 2013 http://dx.doi.org/10.1016/S0140-6736(13)61613-x.

[188] Ibid.

[189] Ibid, T9/5.

[190] Exhibit A4, T221/3516; Noise & Health *(*September-October 2012) (Volume 14:60) 237-43.

from published observational studies concluded that "the odds of being annoyed [are] significantly increased by wind turbine noise", and "the odds of sleep disturbance was also significantly increased with greater exposure to wind turbine noise". These findings were based on a meta-analysis of six studies. The article concluded:

> There is some evidence that exposure to wind turbine noise is associated with increased odds of annoyance and sleep problems. Individual attitudes could influence the type of response to noise from wind turbines. Experimental and observational studies investigating the relationship between wind turbine noise and health are warranted.[191]

303. There are also a number of articles in the evidence which explore the possibility that some individuals are more sensitive to low frequency sound and infrasound, and that this may produce motion-sickness like symptoms in some people. The abstract of an article which appeared in the March 2015 edition of the *Journal of the Acoustical Society of America* stated:

> For at least four decades, there have been reports in scientific literature of people experiencing motion sickness-like symptoms attributed to low-frequency sound and infrasound. In the last several years, there have been an increasing number of such reports with respect to wind turbines; this corresponds to wind turbines becoming more prevalent. A study in Shirley, WI, has led to interesting findings that include: (1) To induce major effects, it appears that the source must be at a very low frequency, about 0.8 Hz and below with maximum effects at about 0.2 Hz; (2) the largest, newest wind turbines are moving down in frequency into this range; (3) the symptoms of motion sickness and wind turbine acoustic emissions "sickness" are very similar; (4) and it appears that the same organs in the inner ear, the otoliths may be central to both conditions. Given that the same organs may produce the same symptoms, one explanation is that the wind turbine acoustic emissions may, in fact, induce motion sickness in those prone to this affliction.[192]

The article made recommendations for further research.[193]

304. The evidence includes a number of articles which address the possibility that, by reason of the anatomical composition of the human ear, "sounds that are not perceived" may nevertheless be processed or "transduced by the ear", and "may still affect people in ways that have yet to be fully understood".[194] A number of these articles record that, while "hearing and perception in the mammalian ear are mediated by the inner hair cells (IHC)",

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[191] Exhibit A29, T69/1; Onakpoya IJ, O'Sullivan J, Thompson MJ, and Heneghan CJ, "The effect of wind turbine noise on sleep and quality of life : A systematic review and meta-analysis of observational studies", Environmental International 82 (2015).

[192] Exhibit A4, T270/5476, Schomer PD, Erdreich J, Pamidighantam PK and Boyle J H, Abstract in "A theory to explain some physiological effects of the infrasonic emissions at some wind farm sites" (2015) Acoustical Society of America, pp 1356-1365.

[193] Ibid, T270/5484.

[194] Exhibit A29, T86/1; Salt AN and Lichtenhan JT "Perception-based protection from low-frequency sounds may not be enough" inter-noise (2012)

the human ear "also contains more numerous outer hair cells (OHC)", and that the OHC operate in a different manner and "are more sensitive … to low frequencies and respond to very low-frequency sounds at levels below those that are perceived".[195]

305. In an article entitled "Infrasound from Wind Turbines Could Affect Humans" published in 2011, Dr Alec Salt and Dr James Kaltenbach postulate that:

> Although the cells that provide hearing are insensitive to infrasound, other sensory cells in the ear are much more sensitive, which can be demonstrated by electrical recordings. Responses to infrasound reach the brain through pathways that do not involve conscious hearing, but instead may produce sensations of fullness, pressure or tinnitus or have no sensation. Activation of subconscious pathways by infrasound could disturb sleep. Based on our current knowledge of how the ear works, it is quite possible that low frequency sounds at the levels generated by wind turbines could affect those living nearby.[196]

306. In a later article, published in 2014, the same authors provided a diagram illustrating the portion of "the wind turbine sound spectrum" which is too low to be heard, but "sufficient to stimulate the OHC of the ear".[197] They also stated that:

> Evidence is mounting that loss of or even just overstimulation of OHCs may lead to major disturbances in the balance of excitatory and inhibitory influences in the dorsal cochlear nucleus. One product of this disturbance is the emergency of hyperactivity, which is widely believed to contribute to the perception of phantom sounds or tinnitus. The granule cell system also connects to numerous auditory and nonauditory centres of the brain. Some of these centres are directly involved in audition, but others serve functions as diverse as attentional control, arousal, startle, the sense of balance, and the monitoring of head and ear position.[198]
>
> …
>
> Although there have been many studies of infrasound on humans, these have typically involved higher levels for limited periods (typically of up to 24 hours). In a search of the literature, no studies were found that have come close to replicating the long-term exposures to low-level infrasound experienced by those living near wind turbines. So, to date, there are no published studies showing that such prolonged exposures do not harm humans. On the other hand, there are now numerous reports (e.g., Pierpont, 2009; Punch, James, & Pabst, 2010), discussed extensively in this journal, that are highly suggestive that individuals living near wind turbines are made ill, with a plethora of symptoms that commonly include chronic sleep disturbance. The fact that such reports are being dismissed on the grounds that the level of infrasound produced by wind turbines is at too low a level to be heard appears to totally ignore the known physiology of the ear.[199]

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[195] Ibid.

[196] Ibid, T88/1; Salt AN and Kaltenbach JA "Infrasound from Wind Turbines Could Affect Humans" (2011), Abstract.

[197] Exhibit A52; p 298; Salt AN and Kaltenbach JA "Infrasound From Wind Turbines Could Affect Humans", Bulletin of Science, Technology & Society 31(4) (2011).

[198] Ibid, p 299; citing Kaltenback, et al., 2002; Kaltenbach JA & Godfrey DA 2008; Shore SE 2005; and Godfrey et al., (1997) (citations omitted).

[199] Ibid, p 301.

307. There are also a number of articles before us postulating that the low frequency noise generated by wind turbines may stimulate the vestibular systems resulting in symptoms such as disequilibrium, nausea, vertigo, anxiety, etc.[200]

308. An Information Report prepared for the Multi-Municipal Wind Turbine Working Group, Ontario, Canada, dated July 2015 states as follows with respect to infrasound and low frequency noise:

> Noise measurements for most studies and environmental assessments have been limited to the measurement of *audible* sound *outside* homes—using dBA weighted monitoring which is insensitive to infrasound frequencies. Some studies and environmental assessments have even relied on *projected* audible sound averages from computer produced models.
>
> Such observations and projections fail to take appropriate account of the distinguishing signature of the sound from a wind turbine. Unlike the more random naturally occurring sounds (such as wind or lake waves which may themselves have an infrasound component), the sound from wind turbines displays characteristics that produce a *pattern* that the ear and audio processing in the brain recognize. Our hearing is strongly influenced by pattern recognition. (This is why we can pick out the sound of a familiar voice even in a crowded room with many people speaking).
>
> One recognizable wind turbine pattern is a tonal signal of *sharply rising and falling pulses* in the infrasound range, (typically about 0.75 Hz, 1.5 Hz, 2.25 Hz, 3.0 Hz, and so on). It is produced by the blade passing the tower. At this frequency these pulses may be "felt or sensed" more than "heard" by the ears. Research by Dr. Alec Salt and others has demonstrated that subaudible infrasound does result in a physiological response from various systems within the body.
>
> The second recognizable pattern is the amplitude modulation. This is the typical "swoosh" rising and falling that *is* audible.*
>
> A third recognizable pattern of sound from wind turbines results from the equipment in the nacelle (such as the gearbox if the turbine has one) and ventilating fans. Although in some cases this third sound source may become predominant, it is usually of lesser effect that (sic) the first two.
>
> We now know that *subaudible pulsating infrasound can be detected inside homes* near operating wind turbines. It can also be identified up to 10 kilometres distant. We know also that *very low levels of infrasound and LFN are registered by the nervous system and affect the body even though they cannot be heard*. The research cited in this report implicates these infrasonic pulsations as the cause of some of the most commonly reported "sensations" experienced by many people living close to wind turbines including chronic sleep disturbance, dizziness, tinnitus, heart palpitations, vibrations and pressure sensations in the head and chest etc.
>
> Similarly, there is medical research … which demonstrates that pulsating infrasound can be a direct cause of sleep disturbance. In clinical medicine, chronic sleep interruption and deprivation is acknowledged as a trigger of serious health problems.[201]

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[200] Exhibit A29, T15/3; Ambrose SE and Rand W "Adverse Health Effects Produced by Large Industrial Wind Turbines Confirmed" The Bruce McPherson Infrasound and Low Frequency Noise Study December 14, 2011.

[201] *It results from the blade passage frequency which acts to cause the broadband sound produced by the turbulence associated with the airfoil of the wind turbine passing through the air to rise and fall. Exhibit

309. The Superior Health Council of Belgium issued a statement in April 2013 which we consider correctly reflects much of the evidence before us:

> Modern wind turbines are unlikely to have any direct effects on health and well-being other than annoyance and possibly sleep disturbance. Both annoyance and disturbed sleep can, however, lead to undue stress, which may adversely affect the health and well-being of those concerned.
>
> …
>
> It follows that the operation of wind turbines or wind farms may affect the quality of life (i.e. health and well-being), but in a complex fashion that depends on a variety of interrelated factors.[202]

310. In an article published in the journal *Noise and Health* in September-October 2011,[203] the relationship between wind turbines and health was depicted as follows:

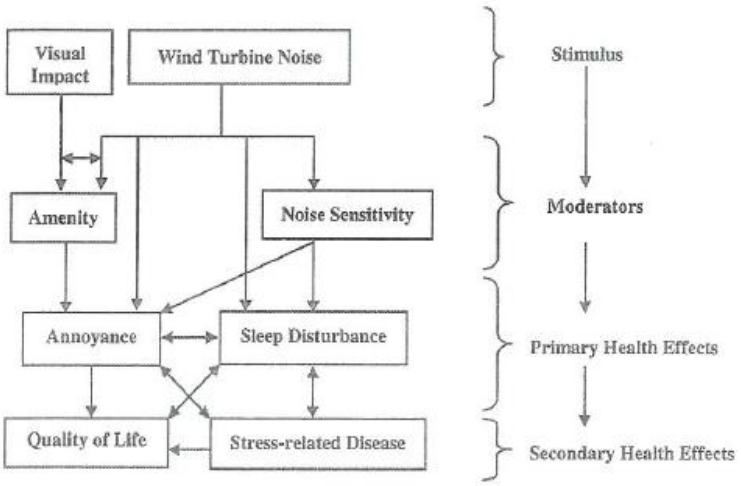

Figure 1: A schematic representation of the relationship between wind turbines and health in a semirural setting. The multiplicity of relationships emerges due to variability in the response of individuals to noise

THE EXPERT EVIDENCE

The applicant's expert evidence - general

311. The applicant led evidence at the hearing from six experts. These were:

A29, T103/5-6; Stelling A, Palmer W and Krogh C "An information report prepared for the Multi-Municipal Wind Turbine Working Group (2015) (emphasis in original).

[202] Ibid, T10/1; Superior Health Council, Publication of the Superior Health Council No. 8738 3 April 2013.

[203] Ibid, T99/344; Shepherd D, McBride D, Welch D, Dirks N and Hill EM "Evaluating the impact of wind turbine noise on health-related quality of life", Noise & Health: A Bi-monthly Inter-disciplinary Internal Journal, September-October (2011) Volume 13, Issue 54.

(a) Dr Bruce Rapley who describes himself as an “independent consulting scientist”. Dr Rapley has a B.Sc (Biological Systems), MPhil (his thesis concerned “System design and testing of a medical biostimulator”), and a PhD (Environmental Health, Acoustics, Human Health and Cognition).

(b) Dr Robert Thorne. As noted earlier, Dr Thorne is presently the Chief Executive Officer and Registrar of the Board of Studies of Acoustar Work Health and Safety Training Centre, a training organisation which he established in 2014. He has a number of academic qualifications including a PhD in Health Science (“Assessing intrusive noise and low amplitude sound” awarded by Massey University in 2007), a Diploma in Science (Noise Management) and Diploma in Acoustics and Noise Control awarded by the UK Institute of Acoustics in 1985.

(c) Mr Steven Cooper who is an acoustical consulting engineer. Mr Cooper holds a BSc (Engineering) from the University of New South Wales and a MSc (Architecture) from the University of Sydney.

(d) Mr William Huson who is an acoustical consultant. Mr Huson has a BSc (Hons) in Applied Physics obtained in the United Kingdom in 1975 and a MSc (Sound and Vibration Studies) from the Institute of Sound and Vibration Research at Southampton obtained in 1977.

(e) Dr Mariana Alves-Pereira who is an Associate Professor in the School of Economic Sciences and Organizations at the Universidade Lusófona in Lisbon, Portugal. Dr Alves-Pereira has a Bachelor degree in Physics, a Masters degree in Biomedical Engineering and a Doctoral degree in Environmental Science, the latter from the Universidade Nova de Lisboa in Caparica, Portugal. Dr Alves-Pereira is not a medical practitioner but through her work has learnt some medical concepts.

(f) Dr David McBride who is Associate Professor in Occupational and Environmental Medicine at the University of Otago in New Zealand. Dr McBride is a fellow of the Australasian Faculty of Occupational and Environmental Medicine and has completed a PhD in occupational health concerning the health effects of noise, especially impulse noise.

312. We accept that each of the experts has the academic qualification just outlined.

313. It is appropriate to say something about the difficulties which the manner in which the applicant elicited evidence from these witnesses caused in the hearing.

314. Each of the experts provided a written report at the request of the applicant's solicitors. A curiosity of the solicitors' requests to the experts (contained in a document extending over 12 pages) is that, despite the different expertise of the experts, the instructions to them were identical. We have described this as a curiosity because it is not reasonable to suppose that the experts in the diverse fields had sufficient expertise to express opinions on all the questions raised by the applicant's solicitors. The experts were left to decide for themselves the matters in the request which were within their qualifications, expertise and experience.

315. The experts were requested, first, to have regard to, and to address, the matters in the respective SFIC which the applicant and the Commissioner had filed in compliance with a direction of the Tribunal. The purpose of the applicant referring the experts to the Commissioner's SFIC is unclear as, understandably, the SFIC contained a mixture of factual assertions, legal and factual issues and a summary of the Commissioner's contentions about each. The requests to the experts had the unfortunate consequence that some of the experts addressed matters in the SFIC, including in an argumentative way, without regard to whether the subject matter was within their field of expertise. These circumstances may account, in part, for one of the applicant's experts (Dr Rapley) thinking that it was appropriate for him to give his own critique of the Commissioner's case generally.

316. Secondly, the experts were asked to consider the term "disease". The meaning of the term is relevant given the terminology of Item 13. However, the applicant's request to the experts appeared to overlook that the meaning of the term is a matter of statutory construction, and not a matter of evidence.

317. The experts were referred to the meaning attributed to the term "disease" for which the Commissioner contended, to various statutory, dictionary and other definitions of the term and were then requested to address eight questions concerning the association between industrial sound and vibration, on the one hand, and disease, on the other. We will refer to these questions as the "General Questions".

318. The General Questions were of a wide ranging kind as the experts were asked to express opinions about such diverse effects from industrial sound as annoyance, sleep disturbance and mental disorders. We note also that the solicitors appeared to guide the experts' responses by directing their attention to particular literature.

319. Thirdly, the experts were requested to address a series of questions (the "Wind Turbine Questions") which were, in substance, similar to the General Questions and concerned the association between noise generated by industrial scale wind turbines, on the hand, and disease on the other. The experts were asked to provide their opinions based on the literature concerning "wind farm noise …, your knowledge, experience and any research conducted by you".

320. The applicant then asked each expert to present, if possible, audio recordings of industrial wind turbines in operation together with details concerning the turbines to which the recordings related and the circumstances in which the recordings were made. Only Dr Thorne responded to this invitation.

321. The applicant's fifth request was that each of the experts provide "a brief analysis" of the papers and reports cited by the Commissioner in [30]-[37] of the Commissioner's SFIC. With respect to these papers, the experts were asked to include a statement as to:

    (i) whether or not the material was peer-reviewed;

    (ii) whether the material was published and, if so, where;

    (iii) the validity of the conclusions in each paper on the question of whether wind farm noise is associated with, contributes to, or causes "diseases" in humans;

    (iv) the quality of the paper or report and the research (if any) upon which it is based.

322. The first two questions were inapposite to the kinds of papers to which the Commissioner had referred. The third and fourth requests were remarkably wide.

323. Sixthly, each of the experts was asked to express an opinion as to whether research work carried out by one Neil Kelley and others on behalf of NASA in relation to wind turbine noise emission was relevant to the noise generated by modern wind turbines. Again, this was a broad request as each expert was requested, in effect, to review the entirety of the

research work carried out by Mr Kelley and others on behalf of NASA and to express wide ranging opinions concerning it.

324. The applicant's seventh request related to three decisions of environmental courts or planning tribunals concerning wind turbines. The experts were asked to "comment" on the "relevance" of these decisions to the question of whether:

(a) industrial noise and vibration is associated with, contributes to, or causes "diseases" in human beings; and

(b) wind farm noise, including low frequency noise and infrasound or vibration, is associated with, contributes to, or causes "diseases" in human beings.

The issues raised by these requests were extraneous to the grounds of objection which formed the subject matter of the review in the Tribunal. It is not apparent that any of the experts had the necessary expertise to provide the opinions sought.

325. Next, the applicant asked whether the experts were aware of any court or tribunal decisions on the issue of excessive industrial noise or vibration and, if so, to describe the outcome of the decision "as it relates to the effects of such sound or vibration on human health". The applicant referred the experts in this respect to *Metroll Victoria Pty Ltd v Wyndham CC* [2007] VCAT 748. Again, this was an extraneous topic.

326. The applicant's ninth request referred the experts to Articles 7 and 12 of the ICESR, Article 7 of the ICCPR, and Article 16 of the CROC and asked for opinions on nine questions. Most of these questions were of a very general kind. For example, the solicitors enquired in respect of "the right of anyone to the enjoyment of the highest attainable standard of physical and mental health", whether "setting limits for, or controlling the exposure of people to, industrial noise and vibration [would] promote or protect that right". There were several other questions of a like kind. In our opinion, requests of this kind did not identify an appropriate subject matter for expert opinion.

327. The applicant's 10th request to the experts was to express an opinion "based on the literature, your knowledge, experience and/or your own research" as to the statement in the 2015 NHMRC Information Paper that:

> Given the poor quality of current evidence and the concern express by some members of the community, there is a need for high quality research into possible

health effects of wind farms, particularly within 1,500 metres.

This topic, considered by itself, was outside the confines of the review by the Tribunal, although the desirability for further research may have some bearing on the purpose of the applicant's activities.

328. Finally, under the heading "Knowledge of Waubra Foundation's purposes and activities", the experts were referred to the Macquarie Dictionary definitions of the words "promote", "protection" and "protect" and asked to express opinions as to whether the applicant:

(a) promotes or protects human rights of the kind set out in the identified articles of the international covenants;

(b) has at its principal activity promoting the prevention or the control of diseases in human beings.

In our view, these were not appropriate subject matters for expert opinion.

329. The applicant concluded its request with a statement that the experts should feel free, in the event that they considered that the matters upon which they were requested to opine were beyond their qualifications and experience, to state that that was the case and to decline to address that question.

330. We consider it appropriate to record our view that the manner of requesting expert opinions adopted by the applicant in the present case is inappropriate. As already indicated, it had a number of adverse consequences. It led to many of the experts misunderstanding their task, to many of them proffering opinions on matters which did not require, or which were beyond, their expertise and, in some instances, to an apparent belief that it was appropriate for them to advocate on the applicant's behalf in the proceedings, and for them to provide evidence in the nature of a testimonial for the applicant. The attempts by several of the experts to respond to the applicant's requests led to a lack of appropriate focus in the case of several of their reports and contributed greatly to the volume of material put before the Tribunal. It has also contributed greatly to the complexity of the Tribunal's task in absorbing the evidence and in preparing these reasons.

331. We mention in particular Dr Rapley. He provided a written report extending over 139 pages in addition to 11 appendices extending over another 70 pages.

332. Dr Rapley's written report is notable for its lack of objectivity and detachment. A particularly clear example is apparent in the section with which Dr Rapley concluded his report under the heading "Denouement". That section included the following:

> [15.1] Today we like to believe that we live in a society that is sophisticated socially, politically and technologically. But is that true? When we see the ongoing problems of starvation, the people trafficking, poverty and the general malaise of humanity, it is hard to believe that we are truly advanced.
>
> [15.2] Mahatma Ghandi was once asked what he thought of Western Civilisation. His reply still shocks today: "I think it would be a good idea".
>
> …
>
> [15.5] When I look at the case before us that the Respondent has created, my heart sinks as I see the basic principle of protecting people from harm dissolve into dust.
>
> [15.6] The Waubra Foundation is a forward-thinking and brave organisation that seeks to raise the level of knowledge and as a consequence, public health. Its focuses on the problem, harm and suffering, and seeks to support new initiatives to change the status quo of ignorance into a more enlightened and informed state.
>
> [15.7] It appears to me that the Respondent has chosen to set sail on a course to destroy this organisation. To me this is a most heinous crime. That it smacks of industry collusion and bases itself on semantic argument more able to subvert than support human initiative is a sad indictment on the people, the organisation and democracy. It brings the very notion of humanity into disrepute.
>
> [15.8] I, and many others, have tried to avoid this train wreck, but the Respondent remains dumb to our protestations and advice. I believe I have shown in this evidence that the Respondent's claims are not only untrue but show a complete disregard for more than 30 years of research to the contrary. That they can make the claims they have appears to show either professional negligence in their choice of research studies or an attempt to deceive by misrepresenting the research literature.
>
> [15.9] To deny the suffering of fellow Australians, and many more overseas, as well as removing the very hope of finding the answers and remedies that the Waubra Foundation was set up to do, is surely a betrayal of the very concept of charitable institutions that the Respondent is supposed to nurture.

333. The polemical, partisan or at least non-objective nature of Dr Rapley's report was evident in numerous other passages, including [3.6]-[3.8] (concerning the relationship between noise and disease), [4.1]-[4.12], [4.22.14], [5.1.22], [5.3.13], [5.3.22]-[5.3.23], [5.5.2], [5.5.48], [5.43]-[5.45], [5.47.3], [5.47.39], [5.47.55] and [5.48.10].

334. We observe that Dr Rapley had sent a letter dated 6 February 2015 to the ACNC in support of the applicant's "appeal". The letter was in intemperate terms, as the following passages indicate:

> In conclusion, the ruling made by Assistant Commissioner Locke and your organisation is an egregious error of judgment and you should all be held, collectively and corporately, liable. The science is pointing the way to a clearer understanding of the dangers of environmental sound, much of which has been acknowledged for decades. In arriving at this interim ruling, Assistant Commissioner Locke insults me, my work, my qualifications and experience. Further, he insults the vast number of scientists who are working in this area, many of them for decades and [who] are now trying to get the science in front of legislators before more human tragedy results.
>
> It is my recommendation that Assistant Commissioner Locke and your organisation be held to account and the case tested in a court of law with regard to the ruling of December 11, 2014. I further suggest a class action suit be taken against the ACNC by those whose money will have been misappropriated by this ruling if it remains in place. The current course chosen by the ACNC has aimed the ship towards the iceberg and if a real human tragedy is to be averted, that course needs to change now. If you fail to undertake this manoeuvre it is only a matter of time before that fateful collision occurs.
>
> …
>
> I wonder how brave Assistant Commissioner Locke would be if he were to be made personally liable for the potential adverse health effects of his misinformed ruling?
>
> …
>
> One final point: The consequences of your organisation's ruling is tantamount to misappropriation of funds. Hundreds of people have donated money to the Waubra Foundation, in good conscience, well-informed of the aims and objectives of that organisation. To rule that the Waubra Foundation is not a charity predicated on dissemination of health information and facilitating research related to industrial noise problems is to deny the reality of the situation and smacks of some sinister, political agenda. The consequence is that the money given in good faith will be misappropriated for some other purpose. This is what we call **theft** in New Zealand. And your organisation, as it stands, is solely responsible for that. [204]

335. In the light of this letter, it is hardly to be supposed that Dr Rapley brought an attitude of independence and objectivity to his evidence in the Tribunal.

336. Section 5 of Dr Rapley's report was entitled "Expert opinion on references supplied". This was a substantial section, occupying some 67 pages. In this section, Dr Rapley proffered his critique of the 10 papers listed in para 4 of the General Questions (and repeated in para 5 in the Wind Turbine Questions). It was apparently responsive to the applicant's fifth request noted earlier. We note that Dr Rapley provided this critique without reference to the limits of his own expertise. It has a gratuitous and patronising quality.

[204] Exhibit A4, T190/2603-2605 (emphasis in the original).

337. We will in the review that follows, refer to Dr Rapley's evidence. However, having regard to the matters just identified, we have concluded that very little weight should be given to his opinions.

338. Dr Thorne understood his task as an expert acoustician in a particular way, namely:

> [T]o assist the [Tribunal] with an assessment of whether the Waubra Foundation is able to promote the object of the Foundation:
>
> > To promote human health and well-being through the prevention and control [sic] diseases and other adverse health effects due to industrial sound and vibration.

339. This understanding of his task led to Dr Thorne annexing to his report "copies of the reports or documents that I believe are relevant to this hearing". He said that he did so "in order to assist the Tribunal".[205] This had the consequence that Dr Thorne's report comprised 11 lever arch volumes.

340. Dr Thorne is correct in understanding that his task was to assist the Tribunal. However, experts do that by focusing on particular defined matters which are within the area of their expertise. Their task is not the provision of information generally to a court or tribunal about the subject matter of the litigation or of the inquiry. It is unfortunate that Dr Thorne was distracted from doing so in the present case by the nature of the instructions from the applicant's solicitors. In particular, it is unfortunate that Dr Thorne was encouraged to think that his task was to inform the Tribunal generally about aspects of noise and, in particular, noise produced by wind farms, rather than responding to focused questions which were within the limits of his expertise.

341. We note that Dr Thorne and Mr Cooper had also sent letters of endorsement of the applicant to the ACNC in relation to the applicant's objection.

342. The Tribunal is not of course bound by the rules of evidence and may inform itself on any matter in such manner as it thinks appropriate (AAT Act, s 33(1)(c)). This does not mean that the rules of evidence and their underlying rationale are of no relevance. The Tribunal's decision must be based upon evidence having probative force (*Rodriguez v Telstra Corporation Ltd* [2002] FCA 30 at [25]) and the rules of evidence have been developed over time with that purpose in mind.

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[205] Exhibit A29, at [3].

343. In the circumstances, we think it appropriate to repeat some propositions concerning expert evidence. The first goes to the circumstances in which expert evidence is admissible. The position under the common law was stated by King CJ in *R v Bonython* (1984) 38 SASR 45 at 46-7:

> Before admitting the opinion of a witness into evidence as expert testimony, the Judge must consider and decide two questions. The first is whether the subject matter of the opinion falls within the class of subjects upon which expert testimony is permissible. This first question may be divided into two parts:
>
> (a) whether the subject matter of the opinion is such that a person without instruction or experience in the area of knowledge or human experience would be able to form a sound judgment on the matter without the assistance of witnesses possessing special knowledge or experience in the area, and
>
> (b) whether the subject matter of the opinion forms part of a body of knowledge or experience which is sufficiently organised or recognised to be accepted as a reliable body of knowledge or experience, a special acquaintance with which by the witness would render his opinion of assistance to the court. The second question is whether the witness has acquired by study or experience sufficient knowledge of the subject to render his opinion of that it would resolve the issues before the court.

344. Sections 76-79 of the *Evidence Act 1995* (Cth) contains provisions to similar effect.

345. The first limb of the first question identified by King CJ is to be noted. Opinion evidence from an expert is not admissible when the court or tribunal is able to form its own sound judgment on the evidence without the assistance of an expert. This requirement was overlooked by the applicant in some instances in the present case. For example, its attempts to lead evidence from experts as to the nature of the applicant's activities and as to the purpose to which those activities were directed.

346. The second limb stated by King CJ is also pertinent in the present context. It is a condition of the admissibility of evidence of expert opinion that the witness has acquired by study or experience sufficient knowledge of the subject to render his or her opinion of value in resolving the issues before the court. The mere possession of some knowledge regarding a specialised subject matter does not make a person expert in that subject matter. It is commonplace for persons who work in multi-disciplinary teams (as had some of the applicant's experts) to acquire some knowledge of matters which are within the expertise of other members of the team. It is understandable that persons who carry out testing for particular purposes acquire some understanding of the use to which their test results may be put or of the significance of particular results. Generally speaking, however, the acquisition of knowledge of this kind does not make the person expert in the other's field of knowledge. Several of the applicant's witnesses, including Dr Rapley and

Dr Alves-Pereira, overlooked this distinction. As noted earlier, Dr Thorne acknowledged the distinction as he was careful to state that he did not profess more than some knowledge of the health effects of noise.

347. Finally, we draw attention to para 3 of this Tribunal's Guidelines to persons giving expert and opinion evidence (to which each expert was referred in their instructions). Paragraph 3 provides:

> A person giving evidence based on his or her special knowledge or experience in an area:
>
> (a) has an overriding duty to provide impartial assistance to the AAT on matters relevant to the person's area of knowledge or experience;
>
> (b) is not an advocate for a party to a proceeding.

348. These are not matters of mere verbal formula. They express a fundamental attitudinal imperative for persons giving expert evidence in the Tribunal.

The Commissioner's expert evidence – general

349. The Commissioner led evidence from two experts. The first was Mr Christopher Turnbull, who has expertise in acoustics. Mr Turnbull gave evidence in an appropriate manner and had a sound understanding of the limits of his expertise. We considered his evidence to be helpful.

350. The second was Professor Gary Wittert, a Specialist Physician with registration in general medicine and endocrinology. Professor Wittert has a MD awarded from the University of Otago in 1994 and is currently a Professor of Medicine and head of the Discipline of Medicine at the University of Adelaide. Professor Wittert said that he has particular expertise in the physiology and pathophysiology of stress, pathophysiology in management of obesity, physiology in use of androgens, disorders of sleep and relationship to chronic disease. We found his evidence to be helpful and note that in its final submissions, counsel for the applicant relied on several of Professor Wittert's opinions.

351. Before proceeding to discuss the expert evidence in detail, we note that there was a degree of consensus on the issues which are of most relevance to us. Unsurprisingly, there was disagreement between the experts on matters arising at what might be described as the frontier of current knowledge. In the absence of conclusive detailed

studies, different experts are inclined toward different interpretations of the available evidence as to what the precise effects of wind farm emissions might be. However, within a more confined realm, there is general agreement as to what the evidence shows.

352. With respect to the medical issues, the experts largely agree that wind turbine emissions are capable of producing, and do produce, noise annoyance (they disagree on the specifics of this). There is also broad agreement that noise annoyance is associated with a range of adverse health outcomes, including hypertension and cardiovascular disease. It will be readily apparent therefore that there is broad agreement that there is a plausible pathway linking wind farm emissions with adverse health outcomes and disease.

353. While it is less centrally relevant for our purposes, there is also broad agreement between the acoustic experts that wind turbine emissions cannot be captured in dB(A), and that the best way of measuring these is through unweighted measurements, subjected to detailed analysis.

354. There is also broad agreement between most of the experts that the best way to determine the precise impacts of wind farm sound emissions would be to combine real time objective health data (including objective measurements of sleep), with simultaneous unweighted sound measurements, and then conduct a time based comparison between the objective health data, and the sound measurements (after analysis to determine the precise components of the sound sign at all relevant times).

355. With the possible exception of one witness (Professor Alves-Pereira), none of the medical experts has asserted that it has been scientifically established that wind farm emissions have a direct and adverse physiological effect on human beings. Some have speculated that this may be the case for some individuals, but they acknowledge it has not been proven.

356. Having thus set the scene, we will proceed to discuss the experts' opinions.

Dr McBride and Professor Wittert

357. By way of medical evidence, the applicant relied upon the report,[206] and oral evidence of Dr David McBride, and the Commissioner relied on the report and oral evidence of Professor Gary Wittert. We accept that Professor Wittert has particular expertise in "the physiology and pathophysiology of stress, pathophysiology and management of obesity, physiology and use of androgens, disorders of sleep and relationship to chronic disease".[207]

358. Both Associate Professor McBride and Professor Wittert are well qualified and on our assessment gave evidence in a way consistent with an attempt to assist the Tribunal.

359. Consistently with our observations above, there was a large measure of agreement between the doctors with respect to the matters which are most relevant for our purposes.

360. Both Dr McBride and Professor Wittert acknowledged that noise annoyance was a complex phenomenon, with a person's response to sound dependent not only on individual perception but also attentional, cognitive and emotional factors. Both also noted that wind turbine sound had very specific characteristics, including variability.

361. Both doctors also agreed that noise could have non-auditory effects, including physiological stress and annoyance. Both further agreed that physiological stress causes circulatory and hormonal changes which could be precursors of systemic conditions such as hypertension and possibly long-term effects in terms of cardiovascular disease.[208] In addition, both doctors agreed that noise could cause sleep disturbance, which in turn could lead to other adverse health effects such as depression and hypertension,[209] and that some individuals are more sensitive to noise and more likely to be annoyed by it. [210]

362. Professor Wittert stated in his report that:

> There does appear to be a relationship between noise exposure and increased risk of adverse cardiovascular outcomes, but the effect is weak and dependent on the magnitude

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[206] Exhibit A63, Report of Dr D McBride dated 28 April 2016.

[207] Exhibit R56, Letter of Professor G Wittert dated 22 May 2016.

[208] Ibid, at [3.2-7].

[209] Ibid, at [2.2].

[210] Ibid, at p 13; referencing van Kamp, Job et al (2004).

(well over 45 dBA for the most part) and consistency of noise exposure and the presence or absence of other cardiovascular risk factors and a range of other confounds. Moreover, we do not know exactly how this effect is mediated; the weight of opinion would suggest annoyance, psychological distress and sleep disturbance may be mediating factors.[211]

363. Professor Wittert also noted the following points drawn from his survey of the literature:

- "The likelihood of perceiving and being annoyed by wind turbine noise increases with increasing intensity of sound";[212]
- "The respondents' attitude to the visual impact of wind turbines on the landscape scenery has been found to influence noise annoyance in a number of studies";[213]
- "People who benefit economically from wind turbines have a significantly decreased risk of annoyance, despite exposure to similar sound levels"; [214]
- "In the case of wind farms, annoyance has been found to be associated with lowered sleep quality and negative emotions";[215]
- "In peer reviewed studies, wind turbine annoyance has been statistically associated with wind turbine noise, but found to be more strongly related to visual impact, attitude to wind turbines and sensitivity to noise. To date, no peer reviewed articles demonstrate a direct causal link between people living in proximity to modern wind turbines, the noise they emit and resulting physiological health effects. If anything, reported health effects are likely attributed to a number of environmental stressors that result in an annoyed/stressed state in a segment of the population";[216]
- "Reviews by Knopper and Ollson (2011) and Kurpas, Mroczek et al. (2013) generally agree that wind turbines can be a source of annoyance for a small group of people. They also generally acknowledged that noise from wind turbines can be annoying and be a cause of sleep disturbance, especially when found at sound pressure levels greater than 40 db(A) or where specific topographic and environmental conditions exist. That aside, annoyance appears to be more strongly related to visual cues and attitude than to noise itself. Self-reported health effects of people living near wind turbines are more likely attributed to physical manifestation from an annoyed state or a nocebo effect (i.e. psychogenic influences) rather than from the wind turbines themselves. In other words, it appears that it is the change in the environment that is associated with reported health effects and not a turbine-specific variable like audible noise or infrasound".[217]
- "Epidemiological studies have shown associations between living near wind turbines and annoyance";[218]
- "Annoyance seems more strongly related to individual characteristics than noise from turbines";[219]

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[211] Ibid, at [3.6].

[212] Ibid, at [5.1]; (we note this is consistent with the Health Canada study).

[213] Ibid, at [5.1].

[214] Ibid; at [5.1]; referencing Pedersen, van den Berg et al (2009) and Janssen, Vos et al (2011).

[215] Ibid, p 14; referencing Pedersen and Persson Waye (2007).

[216] Ibid, p 18, at [5.2.2].

[217] Ibid.

[218] Ibid, p 20, at [5.2.2].

[219] Ibid; referencing Mroczek, Banas et al (2015).

- "Recent data have shown, as previously, a dose-response relationship between emission levels of wind turbine sound and self-reported noise annoyance, but that annoyance mediates the effect of sound on sleep disturbance and the effect of sound is only significant at 40 dB or more";[220]
- "The Structural Equation Models show that among respondents who notice the sound of wind turbines, annoyance is the only factor in the equation that predicts sleep disturbance";[221]
- "Noise sensitive people attend more to noises, discriminate more between noises, find noises more threatening and out of their control, and react to, and adapt to noises more slowly than less noise sensitive people";[222]
- "Noise annoyance is considered to be the (long-term) negative evaluation of living conditions with respect to noise. Acoustic factors are a limited part of the problem. Past disturbances attitudes and expectations are all important as are a range of other factors (Guski 1999):
    - "The personal factors influencing the evaluation are: Sensitivity to noise, fear of harm connected with the source, personal evaluation of the source, and coping capacity with respect to noise.
    - The social factors are: General (social) evaluation of the source, trust or misfeasance with source authorities, history of noise exposure, and expectations of residents. It is considered that significant decrease in a negatively moderating variable is as effective in reducing noise annoyance, as is a significant decrease in noise level".[223]

364. In his report, Dr McBride referred to a study he and others undertook which used Health Related Quality of Life (HRQOL) as an outcome measure. He explained that the study looked at "two community samples, blinded as to the nature (turbine noise) of the enquiry". He stated:

> The first was drawn from 56 residences in the Makara Valley, where a wind turbine farm has been established since 2009, with noise levels between 24 and 54 dB(A). The second group were residents in 250 houses in a geographically and socio-economically matched area, but which were located at least eight kilometres from any wind turbine installation.[224]

365. He went on to explain that in this study, self-reported HRQOL was measured and participants were also asked about amenity and noise sensitivity. He stated that:

> Those residing in the immediate vicinity of wind turbines scored worse than a matched comparison group in terms of physical and environmental HRQOL, and HRQOL in general, also scoring lower in amenity. A comparison between ratings of turbine noise was not possible, but the mean annoyance rating for Turbine group individuals who specifically identified wind turbine noise as annoying was significantly different from the non-turbine noise group, indicating that the turbine noise was perceived as extremely annoying. The

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[220] Ibid, at [5.2.3.1].

[221] Ibid, at [5.2.3.1].

[222] Ibid, at [5.2.3.3]; referencing Stansfield (1992) (emphasis in original).

[223] Ibid, at [5.2.3.3].

[224] Exhibit A63, at [3.18].

> high incidence of annoyance from turbine noise in the Turbine group is consistent with the theory that exposure to turbine noise is the cause of these differences. Importantly, we also found a reduction in sleep satisfaction ratings, suggesting that both annoyance and sleep disruption may mediate the relationship between noise and HRQOL.[225]

366. Dr McBride considered "Turbine noise can therefore cause a decrease in amenity and direct health effects".[226]

367. In his cross-examination, Dr McBride conceded that the Makara Valley study did not control for internal and external factors such as attitude, visual amenity, nocebo effects or financial interest and did not control for all possible confounders. He also accepted that it had not been possible to do a before and after study in order to establish a base line for the study, and the study did not assess a dose response relationship or provide any medical verification of adverse health effects.[227]

368. Despite the significant areas of agreement between them, the ultimate conclusions of the two doctors were different. Professor Wittert concluded as follows:

- There is no evidence that audible noise resulting from the operation of wind turbines constitutes a significant risk to health provided the development is compliant with current guidelines …
- Annoyance is acknowledged to occur in a generally small, but probably variable number of individuals and the extent to which this is problematic in a compliant wind farm may depend more on non-acoustic than acoustic factors.
- There are undoubtedly some particularly noise sensitive individuals.
- The weight of evidence is that when adverse health effects occur they are either circumstantially related or mediated by psychological distress, or both.
- The extent to which psychological distress and or sleep disturbance and/or other adverse health effects occur is dependent on a number of other internal and external factors (attitude, visual amenity, nocebo effects, financial interest, et cetera).[228]

369. Professor Wittert also concluded that the same observations applied with respect to low frequency noise, and:

- There is no evidence that inaudible infrasound is associated with any significant physiological or pathophysiological consequences.

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[225] Ibid, at [3.19].

[226] Ibid, at [3.19].

[227] Transcript, 19 September 2016, p 663 lines 25-27, p 666 lines 23-40, p 667 lines 5-6 and 11-15, p 672 line 19, p 673 line 32.

[228] Exhibit R56, at [6.1]-[62].

- There is no evidence that the level of infrasound produced by wind turbines constitutes a problem to health.[229]

370. Whilst not positively asserting that a causal connection between wind farm sound and adverse health effects had been established, Dr McBride was more guarded in his opinion:

> It is therefore, in my opinion, unwise to state categorically that there will be no effect of wind farm noise; it is clear that there are effects. Several important points require clarification, such as the associations between exposure, including the characteristics of the noise, and effects including sleep disturbance, loss of amenity and more chronic health effects. If these effects are to be avoided then the conditions giving rise to the noise require to be identified.[230]

371. Both doctors were asked to comment on the Health Canada study. Professor Wittert said:

> There were a group of about 14 individuals who were studied with polysomnograms in the Health Canada study, and a much larger group of people who were studied with actimeters, and there was no relationship of exposure to the turbines and any sleep abnormality in exposed compared to unexposed individuals.[231]

He added:

> I say that based on the studies that have been done to date, including the series of studies in 2016, not all of which are Health Canada, but the Health Canada one is polysomnographic – that there is no evidence that there is a systematic problem with exposure to turbines and adverse health effects beyond that some people have annoyance.[232]

372. For his part, Doctor McBride acknowledged that the findings of the study by Health Canada he was referred to appeared to be different from those from his Makara Valley study,[233] and also that the Health Canada study was a much broader and larger study than the Makara Valley study.[234]

373. However, Dr McBride also noted that the Health Canada study appeared to be based on "calculated outdoor A-weighted wind turbine noise levels" rather than actual measurements.[235] Dr McBride also observed that it appeared that noise measurements

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[229] Ibid, at [6.2.2].

[230] Ibid, at [3.20].

[231] Transcript, 16 September 2016, p 630 lines 18-22.

[232] Ibid, p 630 lines 39-43.

[233] Transcript, 19 September 2016, p 675 lines 33-34.

[234] Ibid, p 676 lines 23-27.

[235] Ibid, p 683 line 10.

for the purposes of the Health Canada study were taken down only to 6.3 hertz. He opined that there was no reason to stop measurements below 6.3 hertz as "there's pressure below 6.3 hertz, which may be inaudible but, nevertheless, it's possible it does contribute to the overall perception of the sign".[236]

374. He said that one finding of the Health Canada study was consistent with the results of the Makara Valley study, namely:

> The following was found to be statistically associated with increasing levels of WTN:
>
> > annoyance towards several wind turbine features (i.e. noise, shadow flicker, blinking lights, vibrations and visual impacts).[237]

375. In essence therefore, there was no disagreement between Dr McBride and Professor Wittert that noise could cause annoyance and wind turbines were a potential source of noise which could cause annoyance in particular individuals. There was also a measure of agreement between them that annoyance could in turn have negative health consequences, although the pathway for this was not well established. Professor Wittert stated during his oral evidence:

> There's no clear pathway between annoyance and disease. Many people can be annoyed without being becoming affected. I mean, noise is an irritation with something. Annoyance is an irritation with something, so there would have to be some other, more significant factor occurring before disease could be attributed.[238]

376. However, he acknowledged that if sleep disturbance, psychological distress and annoyance were all present, that "would be a plausible pathway to an adverse health effect".[239] He also agreed (unsurprisingly given the premises) that "if you had a population who were complaining of noise, and they had noise annoyance and also psychological distress and sleep disturbance, if you were able to reduce or eliminate the annoyance, in an overall sense the health of that population would improve".[240] He commented "[s]o it's very much a situation where you can drive it in one direction or the other, but notwithstanding that, it has to be acknowledged and has been that some people are sensitive and some people will be bothered significantly more than others".[241]

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[236] Ibid, p 685 lines 1-5.

[237] Exhibit R44, Health Canada Study, p 3.

[238] Transcript, 16 September 2016, p 639 line 2-6.

[239] Ibid, p 639 lines 35-36.

[240] Ibid, p 640 lines 25-26.

[241] Ibid, p 640 lines 34-37.

377. We regarded this evidence as being consistent with that of Dr McBride. In the event therefore, both doctors seemed to be of the view that noise annoyance accompanied by psychological distress and sleep disturbance amounted to a plausible pathway to adverse health effects of a more concrete kind, potentially including hypertension and cardiovascular disease.

378. We consider that this evidence was consistent with the following representation taken from the Night Noise Guidelines for Europe published by the World Health Organization in 2009:[242]

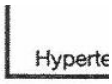

Fig.4.3 Noise effects reaction scheme

[242] Exhibit A4, T211/2982; "Night Noise Guidelines for Europe", World Health Organization Europe (2009).

Dr Bruce Rapley and Dr Robert Thorne

379. Dr Rapley and Dr Thorne were both called to give evidence on behalf of the applicant. However, as their areas of expertise substantially overlap, it is convenient to discuss their evidence together.

380. Doctors Rapley and Thorne agreed to the following propositions:

- The sound generated by wind turbines tends to be complex and made up of different sound components interacting;
- The presence of different and variable sounds interacting could have the effect of increasing the perceptibility or loudness of the sound;
- Wind farms generate significant low frequency sound;
- Some people are more sensitive to infrasound and the effects of wind turbines,[243] and Dr Thorne also expressed the view that infrasound may have a synergistic effect when combined with other sound;[244]
- Low frequency noise behaves differently within residences and may be amplified by the physics of resonance.[245] Dr Rapley observed "For this reason, noise from wind turbines can be even more disturbing inside a house rather than outside";[246]
- Modulating or changing sound levels and characteristics tend to be more intrusive;[247]
- Noise annoyance is associated with sleep disturbance, ischaemic heart disease and hypertension;[248]
- Low frequency noise tends to cause a greater psychological reaction and therefore greater annoyance in humans than high frequency noises.[249] Dr Rapley stated:

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[243] Transcript, 8 September 2016, pp 202-203.

[244] Transcript, 12 September 2016, p 288 line 3.

[245] Exhibit A11, at [6.6.7].

[246] Ibid, at [6.6.7].

[247] Ibid A11, at [6.6.15].

[248] Exhibit A29, pp 19-20; Basner, Dr M (et al), "Auditory and non-auditory effects of noise on health" (2013) The Lancet; Exhibit A11, at [5.48.1].

[249] See also Exhibit A4, T22/3659-3660.

> The important point is that the inbuilt response to certain low frequencies is an inherited survival response. As this functionality occurs so 'low-down' in the brain's hard wiring, it is very difficult to change. One could be forgiven for thinking that neuroplasticity could save the day, and it could, except not at such low frequencies. You can habituate to the daily train traffic that goes past your house, but you cannot habituate to the low-frequency rumble of an earthquake. Some functions are just buried so deep in the brain that they are virtually impossible to re-wire. This tends to be the case for infrasound and very low-frequency sound.[250]

- Lack of sleep exerts deleterious effects on a variety of systems in the human body with detectible changes in metabolic, endocrine and immune pathways;[251]
- There have been relatively few detailed psychoacoustic studies of wind farm noise compared with transportation noise and other industrial noise;[252]
- People can become sensitive to noise.[253] Dr Rapley also gave evidence that it is difficult, if not impossible, for humans to habituate to very low frequency sound and infrasound.[254] He also expressed the view that:

> The observations of animals and humans are consistent if noise sensitisation is present – ongoing exposure to infrasound and low-frequency noise especially if modulating, will result in progressive sensitisation and consequent symptoms of stress related behaviours and eventually diseases.[255]

- Combining acoustic and physiological monitoring is the way for future research to proceed.[256] Dr Thorne also expressed the view that "[t]here are too few properly resourced studies to evaluate cause and effect"; [257]
- The A-weighting system was not an appropriate way to measure wind farm emissions. Dr Thorne described dB(A) as a "first cut measure".[258]

381. Each of the experts also made some observations with respect to matters not commented upon by the other, or not agreed with by the other. In the course of his oral evidence,

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[250] Exhibit A11, at [5.47.17].

[251] Exhibit A29, Appendix 15; Cappuccio FP, Cooper D, D'Elia L, Strazzullo P and Miller M., "Sleep duration predicts cardiovascular outcomes: a systematic review and meta-analysis of prospective studies" (2011) European Heart Journal Advance Access.

[252] Ibid, at [61].

[253] Transcript, 12 September 2016, p 281 lines 31-32.

[254] Exhibit A11, at [5.1.11].

[255] Ibid, at [5.6.16.]

[256] Ibid, at [9.49].

[257] Exhibit A29, at [63].

[258] Transcript, 12 September 2016, p 290 line 26.

Dr Rapley explained why special audible characteristics will cause a different reaction in the "human receiver":

> So that is why, even if it was the same sound level, regardless of what it was, it would be more disruptive to a person hearing them: because of the way that the auditory centre analyses that sound and the effect that the cortex has on that information. So what I am saying is that the sound is received physiologically, so that there's a physiological, neurological mechanism, which is the – the nuts and bolts of receiving the energy, and then there is the overlay of the cognitive thought processes. So what we physiologically receive is then put into a larger context using the cortex, and that is what the science of psychoacoustics is about: understanding that you have, like, a – an electronic circuit that's receiving this information but then it's being interpreted as – like a piece of music.[259]

382. Dr Rapley also made the point in his report that "even if a person does not actually wake up in response to external environmental noise, they can move through different levels of sleep and that this can reduce the quality of the sleep".[260]

383. He noted in his report that, by reference to the published literature, maximum sound pressure levels as low as 33 dB could induce physiological reactions during sleep "including autonomic, motor, and cortical arousals (e.g. tachycardia, body movements and awakenings) Muzet 2007 and Babisch 2009".[261]

384. Commenting on a sonogram taken at Waubra in Australia he stated:

> Note how there is an extreme absence of virtually any sounds above 100 Hz, while there are repeating multiple 'thuds' happening every few seconds that are far higher than the background sound level. This is very, very disruptive to sleep.
>
> If you examine the low-frequency (infrasound) region of all of the sonograms, you will see what appear like little vertical ridges across the time scale. These are the result of Amplitude Modulation, which is termed a Special Audible Characteristic in wind turbine standards and ordinances and often carries a dB penalty because they are far more disruptive than continuous sound levels. Tonality is another example of a special audible characteristic.
>
> Much of the noise monitoring conducted by acousticians for sound consent conditions to provide wind turbine farms with information to verify they are meeting their sound consent is carried out using the A-Weighting and involves simple sound pressure level time histories. Furthermore, they often rely on 10 minute averages that effectively erase any of the fine acoustic detail that is shown in the sonograms above by collapsing the data to a single value![262]

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[259] Transcript, 8 September 2016, p 182 lines 18-28.

[260] Exhibit A11, at [5.3.8].

[261] Ibid, at [5.48.37].

[262] Ibid, at [6.6], [6.6.14]-[6.6.16].

385. Dr Rapley also stated in his report, "[t]here are many pathways by which low frequency and infrasound can enter the human body and thence to the brain. To rely solely on the function of conscious hearing is insufficient to explain the observations".[263] And "[t]o rely on the response of the cochlea that is generally considered to be limited to the range 20 Hz to 20,000 Hz is again naive. As previously discussed, that hearing range can be extended, depending on amplitude of the signal".[264]

386. With respect to future research, Dr Rapley expressed the opinion that:

> Study design is an important aspect of health research and all the various options should be explored and utilised where appropriate however a priority must be to accurately measure the full acoustic exposure dose inside the homes of those who are sensitised to low frequency noise, with concurrent measurement of their physiological consequences including the effects on stress and neurophysiological stress together with biological stress markers and new biological genetic markers of sleep deprivation.[265]

387. He added at the end of his report:

> It is imperative that soundscape data be collected synchronously with objective physiological monitoring. Heart rate, heart rate variability and respiratory rate are fundamental biological elements that must be studied in relationship with environmental stimulus.
>
> Future research should also include EEG data collection.[266]

388. Dr Rapley also expressed the view in his report that "the vast bulk of the sound power energy" generated by a wind turbine "is below 10 Hz".[267]

389. Dr Thorne also expressed some views about the outcome of a 2011 Senate Inquiry into "The Social and Economic Impact of Rural Wind Farms". He noted that the Inquiry made the following recommendations:

> (a) that the National Health and Medical Research Council (NHMRC) review research and
>
> (b) the National Acoustics Laboratories (NAL) conduct a study and assessment of noise impacts of wind farms, including impacts of infrasound.[268]

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[263] Ibid, at [10.26]. See also Exhibit A4, T224/3682.

[264] Exhibit A11, at [10.28].

[265] Ibid, at [5.1.39].

[266] Ibid, at [14.7] and [14.8].

[267] Ibid, at [6.4.12] (emphasis altered).

[268] Exhibit A29, at [42].

390. He proceeded to comment "[t]he NHMRC has undertaken its part, but the NAL has not. Therefore, we are reliant on resident reporting and commissioned noise impact assessments for an analysis of wind farm noise effects".[269]

391. Dr Thorne also expressed the view that while there were insufficient properly resourced studies to evaluate cause and effect "[t]here are, however, a considerable number of highly comprehensive individual studies … that indicate there are problems with wind farms generating noise. Reported problems generally concern sleep disturbance, anxiety and stress".[270]

392. Dr Thorne also made a number of comments with respect to the Health Canada study. He commented that "where the study was done from memory has snow 10 months of the year".[271]

393. When it was put to Dr Thorne during cross-examination that there was no objective link between lack of sleep, wind turbine noise at or below World Health community noise levels and adverse health outcomes he responded as follows:

> I believe the Health Canada study is pointing towards this and that's why their original comment was that there are very few people. That's not quite the right words. No, my reading of the Health Canada study and of some – and some other studies would suggest that they are all linked …[272]

394. Pressed further as to the existence of objective evidence that wind turbine noise at or below World Health Organization levels of community noise causes sleep disturbance, he responded:

> No. I believe the – the Health Canada study is showing that it does occur. It's not in a lot of people and that has sort of refined things, but equally we don't know what instruments they used for testing sleep all those years ago, or – and in fact the – the Health Canada study failed in the sense that they did not do detailed noise measurements and sound characteristics in each individual's home during the sleep tests. I believe some were done as samples, but not – not enough to give what I would call credibility. It was enough to give an idea of effect and, again, I would – I would simply say that that's a – I think the papers are evolving from Health Canada. … I have seen some recently which – and from other people – other studies as people say, oh, you know, that was fine in 2012 when we set this

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269 Ibid.

270 Ibid, at [63].

271 Transcript, 12 September 2016, p 271 lines 3-4.

272 Ibid, p 279 line 45-p 280 line 2.

> up and when we thought about it, we need to move on. We need to do things differently because the ground has been broken by this initial study.[273]

395. It was also put to Dr Thorne that there had been sufficient studies to dispute any cause and effect between wind turbines and health effects. Particular reference was made to the Health Canada study. Dr Thorne responded as follows:

> No, because the studies – nearly all the studies have done analysis based upon estimate or calculated noise levels at residences. They've not done real studies with real acoustic analysis of the dwellings and sound levels inside the dwellings, and whether, in fact, people can hear the turbines, and whether, in fact, these are the noise problems that people are … being disturbed by. The – I still say that … Health Canada are still not sure. It's the – the different papers that are coming out at different times take a lot of reading to try to analyse, but I'm still of the opinion there's still too few properly resourced.[274]

He added later in his evidence:

> That is my … view that we are still at the very – at the early stage using studies like Health Canada and some of the others that have become available in the last four years as starting points, not as end points, but as starting points and put the same resources into them that we've done with … industrial and transportation noise.[275]

396. In the context of explaining the effect of low frequency noise in an otherwise quiet rural environment, Dr Thorne explained:

> With turbines, because they come and go the whole time – the noise comes and goes, and basically at night it becomes very dominant inside a home up to 2000 metres, low frequency noise hits the walls, hits the glass, vibrates and it actually increases the low frequency sound inside the room. Traditionally people have their beds at the corner of – of a room or near the corner of a room. This is the worst possible case for wind turbine noise, because it actually focuses the reflection sound on to the heads of the people in the bed. It increases the sound level by about nine to 12dB by measurement in the low frequency bands of 63 – sorry, 48 to 63 hertz, basically. So these are measures. These then become the next cut, if you will.[276]

397. He went on to explain:

> So if I went into a home that said, "I've got problems with wind turbines," I would go – pop the sound level metre on the bed; tell them to go away for a couple of days; measure what was being recorded inside, outside, windows open, windows closed, wind direction; and try to get a sensible answer as to what the numbers are. The level outside will be about 35 – 30-35dBA in most rural environments with the wind blowing, but at night it can drop down to 18, which we've found in – in Victoria, Queensland. I'm sure you will find here in South Australia. So a sound that is marginally masked at 30-35dBA suddenly becomes dominant, very – it's very audible inside. And the sound that we hear is a rumble thump. It's what we call wind and a – sorry, boot in the dryer noise. And this is – it may only last for a few

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[273] Ibid, p 280 lines 25-37.

[274] Ibid, p 284 lines 26-34.

[275] Ibid, p 287 lines 3-7.

[276] Ibid, p 290 lines 38-46.

> minutes and then the wind changes and the sound disappears. The wind comes back and we get the sound again. So wind farm noise analysis is really difficult, and I'm not trying to emphasise anything other than that. It's – it's not like doing a road traffic noise study or an aeroplane study or trains or noise from Fred Smith's foundry. The other confounding problem we have is that people sleep with the windows open. So if you close the windows automatically you get maybe 10dB difference, but it then locks the room like a sound shell and it vibrates, so that you will get vibration. You can feel this by putting fingertips on to the window glass.[277]

Professor Mariana Alves-Pereira

398. Professor Alves-Pereira provided a written report, dated 28 April 2016,[278] and also gave oral evidence during the hearing.

399. We found the evidence of Professor Alves-Pereira to be of limited assistance except to the extent that it was consistent with that of other experts. However, her evidence sharply diverged from that of the other experts in two key respects.

400. Based on very limited studies, she postulated the existence of a phenomena known as "vibroacoustic disease" due to exposure to low-frequency noise, the "hallmark" of which was the thickening of the pericardium. She expressed the opinion that this thickening could only be detected through the use of forms of investigation such as echocardiography or ultrasound imaging.

401. As she acknowledged, Professor Alves-Pereira is not a medical doctor and her opinion as to the existence of this disease and its cause was not supported by any of the other experts, including those with medical qualifications. In these circumstances, we do not accept her evidence as to the existence of vibroacoustic disease being potentially related to the emissions of wind farms.

402. Professor Alves-Pereira also postulated that the phenomenon of noise annoyance was attributable to prior excessive exposure to infrasound and low-frequency noise resulting in a fusing of the cochlear cilia. Again, this theory was not supported by any of other experts and, indeed, Professor Alves-Pereira conceded that it could only be proved through extensive autopsies combined with detailed histories of the deceased's lifetime noise exposure.

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[277] Ibid, p 290 line 46-p 291 line 17.

[278] Exhibit A31.

403. On the evidence before us, we do not accept that the phenomena of noise annoyance is explained, in whole or in part, by prior excessive exposure to infrasound and/or low-frequency noise.

404. Having regard to these and other matters, we are not prepared to attach much weight to the evidence of Professor Alves-Pereira.

Mr William Huson and Mr Steven Cooper

405. The applicant called two acoustic experts, Mr William Huson and Mr Steven Cooper. In addition to giving oral evidence, each provided a report dated 28 April 2016.[279]

406. There was a large measure of agreement between the evidence of Mr Huson and Mr Cooper. We will focus first on the areas of agreement before addressing the areas where their opinions diverged, or they addressed different issues.

407. During his oral evidence, Mr Huson expressed the view that when measuring the sound in the vicinity of a wind farm, it was best to measure the sound in an unweighted fashion. He said:

> You should also note – there's a thing called temporal changes in noise, and so, as the sound level changes with time, that there's a temporal variation in noise level. If you take 10 minute averages, you don't see these worst case scenarios that happen which is common in wind farms … So you have to then perhaps look further into the actual time history of the variation of sound with different frequencies, so that's a temporal variation. So if you take 10 minutes simplistic block samples, that averages out things that could become clearly audible and annoying and just waters it all down.[280]

He added "[i]t's best to just record everything as best you can and then apply all the different processes that are available through tools to see what might correlate with someone's experience".[281]

408. Mr Cooper agreed, indicating that it was appropriate to combine unweighted measurements with narrow band analysis in order to accurately determine what sound

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[279] Exhibit A37, Report of Mr WL Huson and Exhibit A41, Report of Mr SE Cooper.

[280] Transcript, 14 September 2016, p 393 lines 5-13. This appears to be consistent with the document "Community Noise" published by the World Health Organization in 1995: Exhibit A4, T268/5266.

[281] Ibid, p 393 lines 24-26.

was present. Like Mr Huson, his view was that measurements in dB(A) or dB(G) will not capture the emissions.[282]

409. We note that Mr Cooper's and Mr Huson's evidence in this respect was consistent with the following passage of the Guidelines for Community Noise published by the World Health Organization in 1999:

> A noise measure based only on energy summation and expressed as the conventional equivalent measure, LAeq, is not enough to characterize most noise environments. It is equally important to measure the maximum values of noise fluctuations, preferably combined with a measure of the number of noise events. If the noise includes a large proportion of low-frequency components, still lower values than the guideline values below will be needed. When prominent low-frequency components are present, noise measures based on A-weighting are inappropriate. The difference between dB(C) and dB(A) will give crude information about the presence of low-frequency components in noise, but if the difference is more than 10 dB, it is recommended that a frequency analysis of the noise be performed. It should be noted that a large proportion of low-frequency components in noise may increase considerably the adverse effects on health.[283]

410. Both Mr Huson and Mr Cooper also referred in their evidence to investigations each had undertaken of emissions from particular wind farms.

411. Mr Huson referred to having conducted sound measurements near a number of wind farms including at Cape Bridgewater, Lake Bonney and Waterloo. He indicated that some of the earlier measurements he had undertaken indicated to him that the equipment he was using was inadequate to measure sound in the infrasound region. Accordingly, he obtained a device known as a micro-barometer, from the United States. He explained that this microbarometer, "measures differential pressure down to what's termed DC. So it measures absolute pressure. So it is calibrated with laser trimmings. So from the sensor your accuracy at these very low frequency is far more improved than it is from a sound level meter".[284]

412. He went on to explain that he had used the microbarometer to measure sound in the vicinity of the MacArthur wind farm when a rare event occurred. He said:

> And what happened, which was an extremely rare event, was that whilst monitoring 1.6 kilometres away from the wind farm whilst it was operating at full capacity they had a failure of the substation. That failure caused all of the turbines, all 114 of them to stop very

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[282] Exhibit 41, at [223]-[224].

[283] Exhibit A4, T210/2754-2755.

[284] Transcript, 14 September 2016, p 375 lines 25-28.

> suddenly, and they didn't repair it until 11 o'clock later that evening. My – one of my microbarometer recording devices was in someone's dwelling 1.6 kilometres away from the wind farm, so what I observed was an extraordinary event where I saw a whole wind farm shut down over the space of minutes, because they have to stop rotating, and then I observed the start-up again later on in the day. And the results were so surprising to me that I mentioned it to Sarah Laurie from the Waubra foundation.
>
> …
>
> The thing that we found astounding was that – when you see an operating wind farm – every time the blade goes past a tower it produces a pulse at a repetition rate of the number of times the blade goes past the tower. When you look at the sound spectrum, you see discrete tones and harmonics of those pulses. That pattern is very clear when the wind farm is operating. And it had always been assumed that when the turbines stop operating – that all those tones disappear. What I found was that different tones became apparent to a similar level as when the wind turbines were operating and that those tones were caused by wind excitation of the structure shaking it and producing infrasound even though the turbines were not rotating. And that was confirmed later in the day when I observed the start-up of all 114 turbines.[285]

413. Mr Huson said that one of the difficulties with measuring infrasound outdoors is "that the instrumentation is prone to be influenced by the wind in the area, and it elevates artificially the noise on the instrumentation".[286] He also referred to measurements he took at the Cape Bridgewater wind farm where he measured an ambient infrasound level inside of about 30dB. He continued:

> And then when the wind farm was started, that infrasound level increased over 60. So there was something like a 30 dB increase in infrasound because they turned the wind farm on. Now that was measurable because that was indoors and the instrumentation was not adversely effected.[287]

414. He further explained during his evidence that often the significant changes in sound between a wind farm operating and when it is shut down occur below 5 hertz. For example, he measured this at the Macarthur wind farm. However, as dBG attenuates the energy below 5 hertz, this would not necessarily be apparent if measurements were done in dBG.[288] He stated "[t]hat's – so if I was to use G-weighting to look at those – or that scenario of the Macarthur wind farm shutting down and then starting up again, I won't see any difference in dBG because it's all happening below five hertz".[289]

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[285] Ibid, p 376 lines 12-34.

[286] Ibid, p 386 lines 9-11.

[287] Ibid, p 386 lines 24-28. Similar observations were made at the Waterloo Wind Farm - See Exhibit A4, T249/4792; Hansen K, Zajamsek B, and Hansen C, "Noise Monitoring in the Vicinity of the Waterloo Wind Farm" (2014) Waterloo Wind Farm Study, University of Adelaide.

[288] Transcript, 14 September 2016, p 392 lines 25-27.

[289] Ibid, p 392 lines 34-36.

415. He also explained some characteristics of the sound he had measured at Cape Bridgewater. He indicated that the Cape Bridgewater turbines tend to generate a particular tone or pitch at about 30 hertz. He then added:

> But what you actually see in the data is it's not a constant level of – it's going up and down. And not only is it going up and down, it has got some characteristic to it which is what they call – it's a modulation. So what's happening with this particular turbine which is interesting is that the output shaft is going at 30 hertz, producing a vibration which is producing this tone, but as the blades go past the tower, if you imagine that you're putting a constant force into a gearbox and turning it at a constant force, every time the blade goes past the tower, it actually releases a little force because it has got a blockage behind it. So you've normally got airflow going across these blades and they're producing a nice, constant torque, except for every time the blade goes past the tower they give off a bit. The next one comes around and it's pushing and then it gives off a bit. The end result is that the rotor is going around at a certain speed. Every time the blade goes past the tower, it eases off just a little. But it's magnified by 105 through the gearbox. So the output shaft is actually going around at 30 hertz, but it's being modulated by the blade pass frequency. So it's like – it's going around at 30 hertz and then it goes slightly faster and then slightly slower when the blade goes past the tower. In the narrow-band frequency analysis, you can see this as three or four tones, with the centre band being 30 hertz, and the distance between each of these side bands in frequency actually relate to the blade pass frequency. So you can actually see mechanically what's going on just by looking at the character of the tone, but you can only do that if you use narrow-band analysis, because if you use third octave, then you don't see those tones and you don't understand the mechanics of what's going on.[290]

416. He also explained the meaning of amplitude modulation as follows:

> What happens when you've got multiple turbines, though, is that they're all producing this 30 hertz tone because they're all the same machine basically, but there's multiples of them. And every wind turbine operates independently. It's self-contained. It has got no connection with any other turbine. It dictates where it points, and it can point in a totally different direction to another one. They're all independent. The end result is that when you mix these 30 hertz signals into the community, what you actually see is these 30 hertz group of tones go up in level as the different turbines go in and out of phase. So they sort of add together and produce higher values of these things and then a little later they will drop. And it's this change in amplitude is amplitude modulation, and it's often caused by multiple turbines for that scenario. Amplitude modulation, though, is also caused by – when you get a swish from a blade, as the blade goes around, it goes swish, swish, and if you had a sound level meter and you look at the level – the overall level of the sound, you will see the meter needle go – so the variation in level is – the amplitude is changing with time. That's amplitude modulation as well. So you get amplitude modulation in a number of scenarios.[291]

417. In his report of 28 April 2016, Mr Huson further indicated that the measurements he took at the Cape Bridgewater wind farm in 2012 "showed that audible sound in the 32Hz one third octave band indoors exceeded the recommended guideline for the level of

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[290] Ibid, p 398 line 34-p 399 line 9.

[291] Ibid, p 399, lines 20-35.

acceptable low frequency sound specified in the work completed for DEFRA".[292] Mr Huson also indicated in his report that in his experience "[s]ound is generated by wind turbines across a wide frequency range, typically 0.5Hz to 2000Hz".[293] He stated "I have measured sound levels inside dwellings that are clearly audible at frequencies down to 30 Hz that are considered to be unacceptable by DEFRA".[294]

418. With respect to amplitude modulation, Mr Huson said that:

> AM can occur across the full sound spectrum and increases annoyance compared to other steady industrial sound sources. AM is not necessarily confined to the rotation frequency and harmonics of the turbine blades.
>
> In the infrasound frequency region I have measured significant amplification due to room resonance of sound from two wind turbines inside a home 2000m away at 17 Hz. This measurement was part of my investigations at the Leonards Hill wind farm …[295]

419. Mr Cooper referred in his report to the fact that he had conducted monitoring at residential properties in proximity to eleven wind farms in Australia.[296] He observed that "I have personally measured wind turbine noise emissions and have found turbine noise in the normal frequency range to be in some cases audible and in other cases inaudible".[297]

420. He indicated that the first measurements he undertook of a wind farm related to the Capital Wind Farm in New South Wales. He said that when he attended a residential dwelling he was able to measure an ambient background level in the order of 28 dB(A) outside the dwelling when there was no wind turbine noise as the blades were not turning. At the same location a few hours later he said the turbines were operating and he was "able to measure an ambient background level of 36 to 38 dB(A) that was generated by the turbines and was not wind noise in that there was no wind at the location in which I was monitoring".[298] He also stated "[t]he turbines were audible inside the dwelling as a low frequency noise with doors and windows of the dwelling closed".[299] He continued:

> In relation to the Capital Wind Farm I conducted measurements at a number of other houses and found, depending upon the weather conditions and the orientation of the wind

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[292] Exhibit A37, pp 3-4.
[293] Ibid, p 7.
[294] Ibid, p 7.
[295] Ibid, pp 7-8 (citations omitted).
[296] Exhibit A41, at [144].
[297] Ibid, at [145].
[298] Ibid, at [149].
[299] Ibid, at [151].

> to the residential receivers, that wind turbine noise could be audible at times and for the very same locations not be audible at other times.
>
> In one house I was able to clearly hear that the wind turbine noise was more audible inside the dwelling that [sic] external to the dwelling.[300]

421. He also observed "I found in all cases infrasound levels to be inaudible".[301]

422. Mr Cooper also referred to an investigation undertaken by him of the Cape Bridgewater Wind Farm. He explained that:

> The study involved noise and vibration monitoring over an eight-week period utilising three houses at Cape Bridgewater being the designated houses of the "specific local residents".
>
> Included in the study was a period of approximately two weeks that covered a planned shutdown of the entire wind farm for the purpose of high-voltage cabling work at a main substation. Monitoring occurred during the shutdown period so as to identify the existing acoustic and vibration environment at the nominated houses when the wind farm was not operating but wind was occurring as part of the natural environment.[302]

423. He further explained that relevant residents were asked to complete questionnaires with respect to their experiences. In the course of the study it became apparent that the descriptors used in the questionnaire were not adequate and the concept of "sensation" was introduced, "being something that the residents neither heard nor felt through the floor of the building but was something that they experienced in their body".[303] He observed "[a]s to the mechanism of how sensation is perceived in humans as a result of turbines it is correct that from my Cape Bridgewater study it is obvious more scientific research is required".[304]

424. Summarising the results of the study, he stated:

> The examination of the resident's observations versus the data from the wind farm found that there was a link between the operation of the wind farm and the high levels of sensation, with severity 5 being equivalent to creating a physical harm to the residents and/or their perspective the sensation was of such an extent and magnitude that required them to leave the homes (or wishing to leave their homes).
>
> The link between the wind farm operation and sensation 5 was found to relate to specific modes of the windfarm, being:

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[300] Ibid, at [152]-[153]. We note that noise monitoring at the Waterloo Wind Farm also showed the outdoor noise level exceeding 40 dB(A). Levels of up to 38dB(A) were also measured indoors - See also Exhibit A4, T249/4792; The Waterloo Wind Farm Study.

[301] Exhibit A41, at [154].

[302] Ibid, at [199]-[200].

[303] Ibid, at [203].

[304] Ibid, at [207].

- turbines commencing to start operations,
- turbines at maximum power such that as the wind speed increased the turbines would be de-powered, and
- when the power output of the windfarm increased or decreased by more than 20%.

> The above power output/change in power that generated sensation 5 could be related to "certain wind speeds" and simply by way of the resident's diaries and the output of the windfarm, a definite link could be established as a cause-and-effect **without** involving any acoustical assessment.
>
> This result satisfied the first part of the brief, i.e. with the provision of wind farm data one can undertake a study of reported impacts without requiring noise data.
>
> If one considers in isolation sensation 5 as defined by the residents and look to the power output of the windfarm, then under the four modes of power described above we found the basis of a hypothesis for disturbance.
>
> If one groups those four specific operations together and only look to the high severity sensation observation, there is a relationship between the wind farm which gives a causal link between the wind farm and those observation of disturbance, i.e. **the study proved a cause and effect**.[305]

425. Mr Cooper went on to observe:

> The most difficult challenge of the study (assumed by some to be the part where I would fail) was to satisfy the second part of the brief to determine "certain sound levels" that related to the disturbances reported by the residents. The report presents the different "standard" types of acoustic descriptors that may be used for the assessment of wind farms. For those parameters, there was no relationship in terms of the operation of the wind farm and the noise levels. **The investigation found that there was a high correlation (>0.9) between the noise levels and the wind speed**. Not a high correlation between the power output and noise.
>
> On undertaking finer resolution of the acoustic signature recorded during the survey, it was found that on restricting the analysis of 1/3 octave bands there was also no relationship to the noise in the operation of the windfarm.[306]

426. He continued "On undertaking further resolution to obtain the narrowband analysis, the high ranking of disturbance provided by the residents was found to be related to what I have described for a number of years as Wind Turbine Signature (WTS)".[307]

427. He explained that:

> The testing for the wind farm being ON, and shortly thereafter the wind farm being OFF, clearly identified the presence of the WTS. The WTS is nothing new in terms of measurements of wind farms, it is simply a term I have used that comes from an

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[305] Ibid, at [211]-[216] (emphasis in original).

[306] Ibid, at [221]-[222] (emphasis in original).

[307] Ibid, at [224]. The Waterloo Wind Farm Study also reported similar sound characteristics, and found "a good correlation between low frequency noise events and complaints registered in noise diaries", Exhibit A4, T249/4792.

> assessment in terms of narrowband signals provides a pattern that is based upon the blade pass frequency of the turbine (number of blades times the number of revolutions per minute divided by 60) and multiples of that blade pass frequency, typically up to the sixth or seventh harmonic. The wind turbine signature (WTS) has been found at other windfarms here in Australia and overseas with slightly different blade pass frequencies depending upon the operating speed of the turbine.
>
> The measurements obtained with the wind farm OFF had no such WTS which has also been found elsewhere. Obtaining multiple on-off measurements at a set location where each set of ON-OFF would occur under the same weather conditions is considered by many acousticians around the world to be the exact set of data that is required to confirm the impact of turbines.[308]

428. He commented that "[t]he use of dB(WTS) as a measurement tool that can be used for further studies (such as medical studies) has been hailed by acousticians around the world as a new step forward".[309]

429. Mr Cooper also referred in his statement to an excerpt from his report on the Cape Bridgewater study as follows:

> Utilising the Cape Bridgewater narrow band results superimposed onto the 1/3 octave band results shows there is a difference between the natural environment and a wind farm affected environment in the infrasound region. Therefore one cannot claim that infrasound levels in the natural environment are similar to that of wind farm affected environments.[310]

430. With respect to his Cape Bridgewater study, Mr Cooper also acknowledged that it was in effect "a pilot study".[311] He continued:

> It indicated that there are issues and there are correlations – or trends is the better word – between certain operations of the turbines. The study has been repeated in Finland and found similar results. But it's correct in the summary that we gave. There's not enough data to change the rules yet. There's not enough data to give a correlation between the wind farm and the impacts because it's outside my area of expertise. … So, therefore, the Cape Bridgewater can't give you a positive adverse effect or no adverse effect. In scientific terms it can say, "This is what we found and it is worth investigating".[312]

431. Mr Cooper confirmed in his oral evidence that he found no correlation between the wind farm operations and noise parameters, although "[w]e did find a very high correlation of wind speed versus a number of parameters".[313] Mr Cooper also explained during his evidence the nature of some of the operations which were associated with high levels of

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[308] Exhibit A41, at [225]-[226].

[309] Ibid, at [236].

[310] Ibid, at [254] (emphasis altered).

[311] Transcript, 14 September 2016, p 426 line 47.

[312] Ibid, p 426 line 47-p 427 line 9.

[313] Ibid, p 450 lines 22-23.

discomfort on the part of residents. With respect to the mode of operation described as "turbines at maximum power, such that, as the wind speed increases, the turbines would be depowered", he explained:

> What happens is that they can adjust the angle of the blade to be more efficiently aligned into the wind, to generate power. Propeller aircraft can tilt the blades a bit to do that. Now, what happens is, when the wind speed gets above 18 metres per second, if they don't depower the blades, the whole thing can get destroyed.
>
> …
>
> So they turn the blades, to decrease the energy taken out of the wind, and what that does is it changes – it puts the blade more of a – a front to the wind, and it creates greater pressure across the blades. So you get more energy. So when you start the turbines, they're not aligned for the wind. So they have problems slicing, and when the turbines are changing their power, because the wind speed is dropping or increasing, the turbines aren't matched up. So you get an instability of the blades that gives rise to more of these pressure sensations that the residents see. So if the turbines are operating at a constant speed, a constant wind, then you have less of an impact than when they're changing, and the same thing occurs, we've found, with power stations, when they're changing their power up and down. The whole fans for the power station change, and at certain times, you can get it to vibrate like a wineglass.[314]

432. He also acknowledged that there was insufficient data to establish a causal relationship between each of the four modes of operation which was identified as problematic. The relationship only existed if all four modes were looked at together.[315]

433. In the course of their written and oral evidence, Mr Huson and Mr Cooper also each made a number of general observations about the nature of wind farm operations, the nature of wind farm emissions and the challenges involved in measuring that sound. Mr Huson explained his understanding of some of the relevant operational features of wind turbines with reference to features which affect the sound they generated. He explained that:

> Pitch controlled wind turbines are those that adjust the pitch of the blade into the wind to optimise the flow and generate as much power and extract as much power out of the wind. So when they turn – let's say they turned a turbine off in the middle of the wind for maintenance, they feather the blades. So they basically turn the blades so that the wind flows nicely across them and doesn't try to turn the rotor. What happens with a wind turbine is that it's invariably the unstable condition when a turbine is starting to run up to speed and when it's coming down from speed when the wind changes that it's in an unstable scenario. So it's trying to control the pitch to match the wind speed that's coming on it to get the maximum out of it. But in doing so, there are feedback errors. It doesn't necessarily get it right. And it's normally in the change of the operating scenario of the wind turbine that causes the most problem to people that I've seen in my experience …[316]

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[314] Ibid, p 455 line 33-p 456 line 3.

[315] Ibid, p 457 line 11.

[316] Ibid, p 387 line 42-p 388 line 7.

434. In his report, Mr Cooper commented that it can be difficult in some instances to clearly differentiate between the effects of sound and vibration:

> in relation to industrial sound or vibration occurring in the low frequency and infrasound regions there can often be an interchange between sound and vibration by reason of difficulty in some cases to distinguish between the two, in that low frequency sound or energy being impacted upon a building may give rise to vibration that people can feel or in turn creates re-generated noise. Similarly, some low frequency or infrasound energy being radiated by industrial sources can be exciting building structures and therefore be either detected as a vibration or heard as a sound by the reaction of the structure.[317]

435. He also commented on the fact that even when wind turbines are stationary they can still generate sound as "you can get wind gusts that come through and they excite the tower and the blades and they generate a pressure pulse which can be detected at residential properties".[318]

436. Both Mr Huson and Mr Cooper also referred to a number of other studies and investigations and referred to a number of government publications.

437. In his report Mr Huson quoted the following statement from the Victorian Department of Health in April 2013:

> There is good evidence that environmental or community noise can lead to:
>
> - annoyance;
> - sleep disturbance
> - cardiovascular disease (including high blood pressure and ischaemic heart disease)
> - tinnitus
> - cognitive impairment in children.[319]

438. Mr Huson's report also includes a chart showing sound pressure levels for a wind farm in the UK, measured according to the G-weighted system.[320] It showed a difference in the infrasound levels surrounding the wind farm in the order of 30 dB(G) at high wind speeds. In other words, the sound pressure levels present were about 30 dB(G) higher when the wind farms was operating than when it was parked.

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[317] Exhibit A41, at [89].

[318] Transcript, 14 September 2016, p 432 lines 42-44.

[319] Exhibit A37, p 5 and Exhibit A4, T297/6232.

[320] Exhibit A37, p 7; Hayes Mackenzie UK DTI Low Frequency Noise Report (2006).

439. Mr Cooper also cites a document entitled "Community Noise"[321] with respect to sleep disturbance as follows:

> "Measurable effects start from about 30 dB LAeq. Physiological sleep effects include changes in the pattern of sleep stages, especially a reduction in the proportion of REM-sleep. Subjective effects have also been identified such as difficulties in falling asleep, perceived sleep quality, and adverse after-effects like reported headache and tiredness. The sensitive groups are believed to include mainly elderly persons, shift workers, persons who are especially vulnerable due to physical or mental disorders, and other individuals who have sleeping difficulties.
>
> The probability that sleep will be disturbed by a particular noise depends on a number of factors including the interference criterion used (e.g., awakening or solely EEG changes), the stage of sleep, the time of night, the character of the noise exposure, and adaptation to the noise. Individual differences in sensitivity are pronounced. Although systematically collected field data on sleep disturbance are limited, there is some consensus of opinion that where noise exposure is continuous, the equivalent continuous sound pressure level indoors at night should not exceed approximately 30 dB LAeq if negative effects on sleep are to be avoided.
>
> Low frequency noise, for example, from ventilation systems, can disturb rest and sleep even at low intensity. In the presence of a large proportion of low frequency sounds a still lower value than 30 dB LAeq would be needed. It should be noted that the adverse effect on sleep partly depends on the nature of the noise source".[322]

Consistently with the evidence of a number of the other experts who have provided opinions in this matter, he also observed in his report that "[t]he matter of sensitisation to low frequency noise and vibration rather than habituation to say traffic noise is an area requiring further investigation".[323]

440. We note Mr Cooper's evidence in this regard was consistent with the following statement in the European Guidelines for Community Noise:

> Special attention should also be given to the following considerations:
>
> a. Noise sources in an environment with a low background noise level. For example, night-traffic in suburban residential areas.
>
> b. Environments where a combination of noise and vibrations are produced. For example, railway noise, heavy duty vehicles.
>
> c. Sources with low-frequency components. Disturbances may occur even though the sound pressure level during exposure is below 30 dBA.
>
> If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise.[324]

441. He also observed that:

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[321] Exhibit 4, T268/5402; Berglund B and Lindvall T.

[322] Exhibit A41, at [118].

[323] Ibid, at [129].

[324] Exhibit A4, T210/2788; Berglund B, Lindvall T, and Schwela DH, "Guidelines for Community Noise" World Health Organization Geneva.

> A common response by representatives of the wind industry to the Inquiries is that there are no health studies to identify adverse impacts from wind turbines. As noted above, there is also an equal statement that there are no studies to show that there are no adverse health impacts.
>
> These answers arise simply because there are no studies into wind turbine operations.[325]

442. Whilst acknowledging the Health Canada study, Mr Cooper observed as follows:

> An issue with the Health Canada study is the consideration of health restricted to the A-weighted data and the absence of viewing the narrow band infrasound data. If the A-weighted contribution of the turbines cannot be extracted from the measurements (due to wind) then there is a restriction on relating the operation of the wind farm to the impacts observed by the residents. This is a finding from the Cape Bridgewater study.
>
> The situation of having hundreds of submissions identifying the health and well-being of residents are affected by wind turbines and none of the environmental authorities or planning authorities can provide any justification of the basis of criteria to protect the community, is simply because there have been no studies to address that very issue.
>
> Adapting acoustic criteria from other noise sources can only be a stop-gap measure which should be identified more correctly as simply precautionary, or should be defined as preliminary, and should have been subject to the appropriate dose-response investigations in light of the significant number of noise disturbance and/or complaints identified by communities in proximity to industrial wind turbine facilities. [326]

443. He also commented:

> It's one study, and it certainly has some problems with it, and it is subject to further work, and I've had discussions with the head of the research team on that project about things that are going to occur as part of an open discussion in the wind turbine group of the Acoustical Society of America in May this year. There are problems, and they agree that they're looking into things, because there are concerns with the data, some of the selection data, the analysis of the data, and the health study – the Canada Health Information … only applies to the two areas that they've looked at, the two studies – two areas, and there are vastly different results for the two study areas that they did.[327]

444. Mr Cooper outlined in his report a recommended approach to determining whether and to what extent there were adverse health impacts as a result of wind farm sound emissions. This involves two steps with the first step comprised of acoustic measurements of the wind farm noise and psychoacoustic assessment of the community response. The second step involved assessing the relationship of wind farm noise to impacts through the use of onsite sleep studies (with acoustic measurements) and "[m]ultidisciplinary research

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[325] Exhibit A41, at [165]-[166].

[326] Ibid, at [168]-[170].

[327] Transcript, 14 September 2014, p 427 lines 27-35.

involving acousticians and psychoacousticians, together with experienced medical practitioners, researchers and clinicians".[328]

445. Mr Cooper referred in his oral evidence to the measures which need to be taken in order to isolate the sound produced by a wind farm from that produced by the wind. With respect to this topic, the following exchange occurred during his cross-examination:

> Q: So you're saying that the Health Canada study – those measures weren't necessarily taken with the Health Canada study?---
>
> A: No. The … Health Canada study didn't address this. They used some wind screens, and they – they actually didn't do measurements. They used predicted levels. Their analysis of the C minus A is just purely a computer calculation, and it will give you a straight line, and they've identified that there are problems in some of their measurements. Either the ambient was affected by road traffic or farming activities.[329]

446. He also qualified his opinion somewhat with respect to the Health Canada study, stating:

> I was critical in terms of the health aspects. There are two reports attached to the Canada study where the work was done by the Canadian geographical survey team and then analysed by a company called MG Acoustics. They provide a very good analysis in terms of infrasound to show that they're measuring the infrasound signature at times 10 kilometres from the turbines. They show the discrete patterns of the blade pass frequency, just as the Shirley wind farm does, just as my study shows and the measurements that I've conducted at other wind farms.[330]

447. Mr Cooper referred to a statement in an "Information Paper" produced by the National Health and Medical Research Council as follows "[g]iven the poor quality of current evidence and the concern expressed by some members of the community, there is a need for high quality research into possible health effects of windfarms, particularly within 1500 metres".[331]

448. Mr Cooper's view is that "Attempting to undertake research using dB(A) levels in my opinion is a waste of time as there is no correlation with the operation of the turbines and dB(A)".[332]

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[328] Exhibit A41, at [179].

[329] Transcript, 14 September 2016, p 428 lines 11-17.

[330] Ibid, p 449 lines 35-42.

[331] Exhibit A41, at [257].

[332] Ibid, at [261].

449. Consistently with his written report, during his oral evidence Mr Cooper reiterated his concerns as to the current absence of appropriate guidelines to protect the community with respect to wind farm sound emissions:

> There is no material set out to show the dose response to show what the criteria that have been nominated as to the percentage of population that will be protected for any point in time. There is no source material to identify doing these levels will protect X percentage of the people for Y percentage of the time. None of that exists in the guidelines.[333]

450. It was put to him that the applicable standard was based on the World Health Organization Guidelines and he responded as follows "the New Zealand standard which is used in Victoria identifies the reference document that is World Health criteria which I said is based on road traffic noise. There is no material in the World Health guidelines in relation to wind farms".[334]

451. Consistent with his written report, Mr Cooper also commented in his oral evidence on the absence of a dose-response curve for wind farm sound:

> So we can have a dose-response curve for aircraft that sets a noise level that will protect 90 per cent of the people 90 per cent of the time. We have a dose-response curve for road traffic, which is a different number to aircraft, still to protect 90 per cent of the people 90 per cent of the time. We have a similar curve for rail traffic, again a different number, and so you have different dose-response curves. Work done by Moller in Germany in relation to two surveys that were done in Sweden showed that the dose-response curve for wind farms occurs at a much lower level. So if you use a dose-response curve for general community or road traffic noise, it's not the same as using it – you can't use that dose-response curve for wind farms until such time as you develop a proper dose-response curve.[335]

Mr Christopher Turnbull

452. Mr Turnbull has provided a statement dated 27 May 2016,[336] and also gave oral evidence at the request of the Commissioner.

453. As noted earlier, Mr Turnbull provided a helpful explanation of the nature of sound and the means which have been devised to measure it, which is uncontroversial and consistent with the other expert evidence.

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[333] Transcript, 14 September 2016, p 411 lines 29-33.

[334] Ibid, p 411 lines 36-39.

[335] Ibid, p 429 lines 3-15.

[336] Exhibit R45.

454. In his report, Mr Turnbull also made some statements which appear to be more controversial:

> At residential setback distances (greater than 500m), the infrasound from a modern wind turbine is below the threshold of hearing but the low frequency sound can be audible depending on the turbine type, setback distance, background sound and meteorological conditions.[337]

And:

> Sound from a wind turbine is not dominant in the low frequency range. The main content of sound generated by a wind turbine is often in the area known generically as the mid-frequencies, being between approximately 160Hz and 1000Hz.[338]

And:

> The level of infrasound and low frequency sound from wind turbines at typical setback distances in Australia are no greater than the level of infrasound and low frequency sound emitted from natural sources such as wind in trees and breaking waves.[339]

455. Mr Turnbull also referred to the results of measurements he and others had undertaken at a number of different wind farms and at different distances which, in all cases, showed that the recorded levels of infrasound were "below the threshold of hearing of 85 dB(G)".[340] Measurements were also taken at other locations including at a beach (25 metres from the high water mark) and 350 metres from a gas fired power station. The measurements taken in proximity to the wind farms were comparable with the other measurements.

456. Mr Turnbull referred to measurements conducted by the South Australian Environmental Protection Authority (the EPA) in conjunction with a firm known as Resonate Acoustics relating to infrasound within houses near wind farms and within buildings away from wind farms. The sound measurements taken were averaged over 10 minute intervals and so do not record "peak" levels. Adopting this approach, the levels of infrasound in city offices were found to be higher than the levels in proximity to wind farms, whether indoors or outdoors. However, we note that noise levels of approximately 78 dB(G) were recorded outdoors in the proximity of the Clements Gap wind farm.

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[337] Ibid, p 4.

[338] Ibid, p 5.

[339] Ibid, p 5.

[340] Ibid, p 6.

457. Mr Turnbull also referred to other measurements undertaken by the EPA and Resonate Acoustics in 2013 with respect to night-time noise levels in dB(A). These showed noise levels outside a house near the Bluff wind farm of about 35 dB(A), inside a house near the Clements Gap wind farm of over 40 dB(A), and likewise outside at a house at Clements Gap wind farm of over 40 dB(A).

458. A summary of the findings of the study cited by Mr Turnbull recorded:

> Organised shutdowns of the wind farms also found that the contribution of the Bluff Wind Farm to low frequency noise levels at Location 8 was negligible, while there may have been a relatively small contribution of low frequency noise levels from the Clements Gap Wind Farm at frequencies of 100Hz and above. This provides a point of contrast to the infrasound study, which identified an insignificant contribution from wind farms to the infrasound levels at the two houses. In this low frequency noise study, it appears that operation of the wind farm may affect low frequency noise levels at frequencies of 100Hz and above. However, based on the data collected as part of this study, low frequency noise levels from the two wind farms did not exceed relevant assessment criteria.[341]

459. Mr Turnbull gave the following response to questions about the different weighting curves and their relative merits:

> The A-weighting is the one, I suppose, which is the most talked about. It is the one that is in most – in fact almost – almost exclusively covers all environmental noise criteria, all occupational noise criteria and it's the one that has had the most research about it and the effects. It is based on the response of the human ear to frequencies … our ears … do not do as well at hearing low frequency as we do in the mid frequencies. And so those frequencies have, I suppose, a penalty applied to them to replicate what the human ear does. And so because it's the weighting which is used most often and it is based on the way the human ear hears it has – it is the one that has had the most research into effects done about it. … But the A-weighting is not perfect. There are some difficulties with it. In particular, there is some concern about the way that it approaches the low frequency and it certainly doesn't cover anything to do with infrasound. And so other weighting scales have been put in place to cover those particular frequency bands. In particular, the C-weighting covers the low frequency.[342]

460. He added:

> And then the one that's not on the graph is the G-weighting scale. That's the result of an International Standard. ISO 7196. That has been designed specifically for infrasound, the human perception of infrasound and annoyance from infrasound. And that is not to be considered instead of the A-weighting but rather as an addition to it, because the A-weighting certainly doesn't cover infrasound very well.[343]

461. He was also asked about the Z-weighting system and responded as follows:

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[341] Ibid, p 9; referencing Evans T, Cooper J, and Lenchine V, (2013). *"*Low frequency noise near windfarms and in other environments*"*, South Australian Environment Protection Authority, Adelaide Australia.

[342] Transcript, 15 September 2016, p 472 lines 17-35.

[343] Ibid, p 473 lines 17-19.

> We need to be very careful to distinguish the difference between the Z-weighting and the unweighted scales. The Z-weighted scale is not unweighted. It applies a – an adjustment below 10Hz. So the Z-weighting scale … it's not supposed to be used for infrasound, and it shouldn't ever be used for infrasound – whereas the linear scale is unweighted. When those levels are used, they need to be compared with something. … so for example, you can compare it with the hearing threshold.[344]

462. As to the characteristics of wind farms and the sound produced by different modes of operation, Mr Turnbull stated as follows:

> At – when they start generating electricity, there is a relatively low level, and that increases as the wind speed and, therefore, the amount of energy that they produce increases. That gets to a point where they – as the wind speed increases, they get to their rated power, which means they're producing as much power as they can possibly produce, even if there are higher wind speeds. Above that point, the noise produced by the wind turbines actually reduces, that is, that – and they do – and the reason for that is that they – the blades – the angle of the blades turns to take less of the wind essentially and less of the energy from the wind and convert that into electricity. And so you get a gradual increase in noise. You get a sharp increase at the time they generate electricity. Lower than that virtually is – is nothing. Above that they produce noise which increases or ramps up until it gets to the point of the maximum generation for the unit, and then it reduced at high wind speeds.[345]

463. Mr Turnbull also confirmed that the sound limit applicable to most wind farms in South Australia was 40 dB(A).[346] He subsequently agreed that the limit was either 40 dB(A) or the background noise, LA90.10, by more than 5 dB(A), whichever is the greater.[347] Mr Turnbull also confirmed that the reference "LEQ 10" relates to an average over a 10 minute period.[348] He indicated that an increase of 5 dB was more than double the energy and would be perceived as a noticeable difference.[349] He indicated that a 3 dB increase is a doubling of the energy,[350] and a 10 dB increase is a doubling of perceived loudness.[351]

464. Mr Turnbull agreed with the proposition that "[t]he noise will always be lower from a wind turbine inside in relation to outside".[352] He also agreed that when low frequency noise is present, A-weighted measurements are not an adequate indicator of annoyance.[353]

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[344] Ibid, p 474 lines 10-18.
[345] Ibid, p 478 lines 9-21.
[346] Ibid, p 483 lines 42-45.
[347] Ibid, p 484 lines 1-2.
[348] Ibid, p 546 lines 30-31.
[349] Ibid, p 484 lines 28-32.
[350] Ibid, p 486 lines 5-8.
[351] Ibid, p 486 line 23.
[352] Ibid, p 492 lines 13-14.
[353] Ibid, p 530 lines 22-24.

Mr Turnbull agreed that the statement in the South Australian EPA Guidelines to the effect that infrasound is not produced by modern wind turbines was not correct.[354]

465. With respect to vibration generated by wind farms, it was put to Mr Turnbull that a noise guideline relating to wind turbines should also address the effects of vibration. He responded:

> No, I don't agree and the reason I don't agree is that I've measured the ground vibration from wind farms and the levels are extremely low. Even measuring directly below the blades of a turbine, the level of vibration achieves the relevant standard for an operating theatre. The levels are extremely low. And, in fact, the vibration in the ground produced by a tree is greater than that of a wind farm – a wind turbine.[355]

466. However, Mr Turnbull accepted during his evidence that if a building is exposed to low frequency energy of a sufficient level, this will cause the building structure, or part of it, to resonate.[356]

SUMMARY OF THE EFFECT OF THE MEDICAL AND SCIENTIFIC EVIDENCE

467. On our analysis, a number of propositions emerge from the medical and scientific evidence. Some of those propositions had unanimous support by the relevant experts, and others had the support of most.

468. The propositions which we understand have unanimous support from the relevant experts or are not contested include the following:

- Wind turbines emit sound, some of which is audible, and some of which is inaudible (infrasound);
- There are numerous recorded instances of WTN exceeding 40 dB(A) (which is a recognised threshold for annoyance/sleep disturbance);
- There are also recorded instances of substantial increases in sound at particular frequencies when particular wind farms are operating compared with those at times when they are shut down.[357]

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[354] Ibid, p 543 lines 40-44.
[355] Ibid, p 496 lines 11-16.
[356] Ibid, p 529 lines 1-3.

- If it is present at high enough levels, low frequency sound and even infrasound may be audible;
- WTN is complex, highly variable and has unique characteristics;
- The amount and type of sound emitted by a wind farm at a given time and in a given location is influenced by many variables including topography, temperature, wind speed, the type of wind turbines, the extent to which they are maintained, the number of turbines, and their mode of operation;
- Wind farms potentially operate 24 hours a day, seven days a week;
- There are numerous examples of WTN giving rise to complaints of annoyance from nearby residents, both in Australia and overseas.

469. The propositions which are supported by the preponderance of relevant expert opinion, and which we accept on that basis, include the following:

- A significant proportion of the sound emitted by wind turbines is in the lower frequency range, i.e. below 20 Hz;[358]
- The dB(A) weighting system is not designed to measure that sound, and is not an appropriate way of measuring it;[359]
- The most accurate way of determining the level and type of sound present at a particular location is to measure the sound at that location;
- The best way of accurately measuring WTN at a particular location is through 'raw' unweighted measurements which are not averaged across time and are then subjected to detailed "narrow-band" analysis;

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[357] Measurements undertaken at the Waterloo wind farm showed that "noise in the 50 Hz third-octave band was found to increase by as much as 30 dB when the wind farm was operational compared to when it was shut down" – Exhibit A51, p 2.

[358] Some examples of relevant measurements are referred to in Exhibit A52, p 296.

[359] It is even acknowledged in the International Standard, ISO 1996-1 that the A-weighting system alone is "not sufficient to assess sounds characterized by tonality, impulsiveness or strong low-frequency content" – Exhibit A29, T43/8; Section 6.1; "Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures", International Standard ISO (1996-1).

- When it is present, due to its particular characteristics, low frequency noise and infrasound can be greater indoors than outdoors at the same location, and can cause a building to vibrate, resulting in resonance;
- Humans are more sensitive to low frequency sound, and it can therefore cause greater annoyance than higher frequency sound;
- Even if it is not audible, low frequency noise and infrasound may have other effects on the human body, which are not mediated by hearing but also not fully understood. Those effects may include motion-sickness-like symptoms, vertigo, and tinnitus-like symptoms. However, the material before us does not include any study which has explored a possible connection between such symptoms and wind turbine emissions in a particular population.[360]

470. We consider that the evidence justifies the following conclusions:

- The proposition that sound emissions from wind farms directly cause any adverse health effects which could be regarded as a "disease" for the purposes of the ACNC Act is not established;
- Nor, on the current evidence, is there any plausible basis for concluding that wind farm emissions may directly cause any disease;
- However, noise annoyance is a plausible pathway to disease;[361]
- There is an established association between WTN annoyance and adverse health effects (eg. this was established by the Health Canada study);

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[360] See Exhibit A4, T224/3687-3688.

[361] We note the World Health Organization has stated: "There is sufficient evidence from large-scale epidemiological studies linking the population's exposure to environmental noise with adverse health effects. Therefore, environmental noise should be considered not only as a cause of nuisance but also a concern for public health and environmental health"– Exhibit A4, T287/5709, citing "WHO. Burden of disease from environmental noise." World Health Organization; 2011 [viewed April 2013]; Available from: http://www.euro.who.int/en/what-we-publish/abstracts/burden-of-disease-from-environmental-noise.-quantification-of-healthy-life-years-lost-in-europe as referenced by Professor G Wittert in Exhibit 56 NHMRC Draft Information Paper: Evidence on Wind Farms and Human Health, "Expert Review: Comments in full", National Health and Medical Research Council, February 2015, Appendix 8; and Exhibit 4, T299/6308, Reference No. 40, WHO "Burden of disease from environmental noise". Bonn: World Health Organization European Centre for Environment and Health, 2011. Available from: http://www.euro.who.int/__data/assets/pdf_file/0008/136466/394888.pdf.

- There is an established association between noise annoyance and some diseases, including hypertension and cardiovascular disease, possibly mediated in part by disturbed sleep and/or psychological stress/distress;[362]

- There are as yet no comprehensive studies which have combined objective health measurements with actual sound measurements in order to determine for a given population the relationships between the sound emissions of wind turbines, annoyance, and adverse health outcomes. Indeed there is as yet no study which has given rise to a soundly based understanding of the degree to which particular types or levels of wind turbine emissions give rise to annoyance, or what levels or types of emissions are associated with what level of annoyance in the population. Because it relied on calculated rather than actual sound measurements, and was limited to the A and C-weighted systems, the Health Canada study did not do this.

ITEM 13: PRINCIPAL ACTIVITY OF PROMOTING THE PREVENTION OR CONTROL OF DISEASE

471. Earlier, we made findings at [233]-[244] concerning the applicant's activity. In the context of the limited evidence adduced by the applicant on the topic, we found that its principal activity was responding to requests for assistance from members of the public. Those requests and the responses to them took various forms.

472. We also indicated, at [121]-[143], that we did not consider it necessary (given the meaning of the term "promote the prevention or control of diseases" which we think appropriate) for the applicant to establish positively, on the balance of probabilities or otherwise, that the sound emitted by wind farms has injurious effects on human health. We held instead that proof of a plausible basis for thinking that a disease exists, or that an association exists between an activity and a disease, could allow the conclusion that an institution facilitating or promoting research or raising awareness about those matters or advocating for their recognition, may satisfy the Item 13 criteria. We reject the submission of the Commissioner to the contrary.

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[362] This is also supported by much of the documentary material before us, including a Victorian Department of Health publication entitled "Wind farms, sound and health", Technical Information, at 7. How can noise affect our health? - Exhibit A4, T297/6232.

473. The applicant submitted that the evidence in the hearing provided plausible and credible evidence of the kind required. Counsel referred in particular to the effect of noise on sleep and, in particular, in disturbing sleep.[363] It was not contentious that impaired sleep, if sufficiently serious, may result in a number of ailments and diseases. Professor Wittert said that "depression and sleep disturbance are, respectively, the first and third most common psychological reasons for patient encounters in general practice".[364] The professor went on to say that insomnia doubles the risk of future development of depression and that insomnia symptoms together with shortened sleep are associated with hypertension. Professor Wittert also said that a person suffering from restricted sleep is exposed to an increased risk of elevated blood sugar levels and endocrine disorders such as diabetes, symptomatic ischaemic heart disease, hypertension, obesity, insomnia and anxiety related illnesses.[365]

474. The applicant emphasised that Environmental Sleep Disorder has been recognised in the International Classification of Diseases, although there does appear to be some controversy about its existence as a separate and discrete condition.

475. We also note that the evidence indicated that the annoyance resulting from noise during sleeping times may be greater for those with a noise sensitivity or who have become sensitised to noise.

476. As our earlier findings have indicated, some wind farms generate sound which is capable of causing, and does cause, annoyance. We are further satisfied that annoyance of the kind which is generated (often associated with psychological distress and sleep disturbance), is a recognised pathway to a range of adverse health outcomes, including hypertension and cardiovascular disease.

477. In addition, it is evident that the matters bearing on the existence of a possible relationship between wind farm sound, annoyance and adverse health outcomes are poorly understood. There has to date been no large scale study comparing the actual sound

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[363] Transcript, 21 September 2016, p 754 line 46-p 755 line 6.

[364] Exhibit R56, p 7.

[365] Transcript, 16 September 2016, p 578 line 34-p 582 line 18.

generated by wind turbines, on the one hand, with the annoyance and objectively measured health effects apparently produced by that sound, on the other.

478. The Health Canada study involved both self-reported and objective health measures. That study supported a connection between WTN and annoyance, but did not link annoyance with the amount of WTN recorded. As the experts pointed out however, there are some significant limitations to this study. A major limitation is that the conclusions of the study were based on calculated, rather than actual, noise measurements (although some of the calculated noise levels were based on measurements). However, as we understand the evidence, the sound generated by wind turbines is so variable that actual measurements are to be preferred. We accept that measurements based on estimates or averages may not accurately reflect the sound which was present when the particular level of annoyance was experienced or recorded.

479. Another significant drawback of the Health Canada study, as we understand it, is that the WTN was measured in dB(A) and dB(C). All of the evidence before us is to the effect that WTN cannot be accurately captured in dB(A), or even dB(C) (although dB(C) is preferable). The preponderance of the acoustic evidence is also to the effect that by far the best way of capturing the sound produced by wind farms is to take unweighted measurements, and then subject them to detailed analysis, including narrow band analysis, to determine the components of the sound which is present.

480. Given the absence of detailed studies, we accept the evidence of many of the experts that there is as yet no “dose-response” curve which applies to wind turbine sound which can be used by policy makers to set appropriate limits on wind farm sound emissions. Consequently, limits are set by reference to the levels which have been found to be applicable in the context of different kinds of noise, such as road traffic noise. In many cases, the limits are set by reference to dB(A). We note again the consensus that wind farm sound emissions cannot be accurately captured in dB(A). We also accept the evidence of most of the experts that, given there is a plausible basis for expecting adverse health outcomes associated with annoyance caused by WTN, there is a need for further studies to determine in particular the levels and types of WTN which are associated with annoyance, as well as the extent to which wind turbine annoyance is associated with adverse health outcomes (which has been addressed to some extent already by the Health Canada study).

481. It follows in our view that the applicant has established that there is a plausible basis for thinking that wind turbine sound (mediated by annoyance) may lead to adverse health outcomes, such as to warrant further investigation. It is unnecessary for us to draw conclusions as to the precise nature of the annoyance which is caused, and whether annoyance may be caused by sound which is not audible (infrasound). That is something which we expect will be the subject of further study and investigation. For our purposes, it is sufficient that annoyance is produced, and it appears that it may be associated with adverse health outcomes. An identification of the causes of that annoyance may allow it to be reduced or mitigated and adverse health outcomes to be reduced or avoided.

482. We regard it as particularly significant that the NHMRC has considered that, despite the absence of direct evidence that exposure to wind farm noise affects physical or mental health, and the poor quality direct evidence that wind farm noise is associated with annoyance or sleep disturbance,[366] it is appropriate to provide funding to the extent of $3.3 million for an evaluation of the "sleep and physiological disturbance characteristics of wind farm noise compared to traffic noise" and for an investigation of whether "exposure to infrasound causes health problems".[367] Given this degree of recognition by the NHMRC, we do not consider that it should be held that the associations which are the subject of the applicant's activities do not have plausibility or credibility, although not as yet positively established.

483. We have not overlooked the evidence to the effect that, while annoyance is produced by wind farms, it may have no association with wind turbine sound emissions and instead be related to other things, such as loss of amenity, the appearance of the turbines and consequent change to the landscape, blinking lights, or other factors.[368] Whether that is so is yet to be established, one way or the other. We accept that the results of the Health Canada study could be consistent with a conclusion that the annoyance experienced is unrelated to the sound emissions. However, by reason of the limitations to which we have

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[366] Exhibit R29, Tab 66.

[367] Ibid.

[368] See, for example, Chapman, S, St. George, A, Waller, K, Cakic, V "The Pattern of Complaints about Australian Wind Farms Does Not Match the Establishment and Distribution of Turbines: Support for the Psychogenic, 'Communicated Disease' Hypothesis", PLOS ONE, Sydney School of Public Health, University of Sydney, New South Wales, Australia, Volume 8, Issue 10, e76584, October 2013 – Exhibit A4, T307/6792.

referred, that study cannot be regarded as conclusive. The evidence indicates that more work is needed to either prove or disprove this proposition.[369]

484. In making these conclusions, we have relied on some evidence and research which came into existence only after 11 December 2014. However, we have thought it appropriate to have regard to this evidence because its significance is not limited to the time at which it first became known.

485. Given our finding that there is a plausible basis for considering that wind farm sound emissions may have an adverse effect on human health, we accept that conducting, supporting and advocating for further research or engaging in awareness raising activities could be properly characterised as activities promoting the prevention or control of diseases (in the sense of that term explained earlier).

486. However, it does not follow that the applicant's other activities, in particular its responses to requests for information, its support and assistance to those complaining of the perceived effects of wind farm sound, and its participation in litigation are also to be regarded as the promotion of the prevention or control of diseases. As noted earlier, activities in the nature of alleviating the suffering of sick and diseased people, or facilitating their treatment, do not constitute *promotion* of the relevant kind. Nor does the mere provision of information to those seeking knowledge constitute promotion of the relevant kind. In our view, it is not possible to characterise the activity of the applicant of the kind which Ms Laurie described as its "first priority" as promotion of the requisite kind. No doubt these activities assist the applicant in developing goodwill and in obtaining information which it can use in relation to the encouragement of research and the like, but it is not of itself the promotion of the prevention or control of diseases. It is not apparent

[369] We note that a number of the expert witnesses who gave evidence, and many other experts, have commented that while the evidence does not support a causal connection, nor does it show that there is no causal connection. See, for example, Exhibit A4, T242/4528, Hansen, C, "Expert Review of the NHMRC Draft Information Paper, 'Evidence on Wind farms and Human Health'", University of Adelaide, April 10, 2014 (also at Exhibit A4, T287/5696). Dr Mathias Basner stated in his review of the NHMRC Draft Information Paper "I agree that, at this time, the scientific literature on health effects of wind farms is only emerging and that the evidence does not allow to draw valid conclusions. However, I believe that this needs to be formulated more neutrally throughout the report, as this limited evidence does neither support that there are health effects nor that there are not. In other words, if the evidence for health effects is limited, this does not mean that there are no health effects (but only that more evidence needs to be gathered to support or reject the hypothesis)" - Exhibit A4, T287/5713.

that the applicant's involvement in litigation has anything other than a remote relationship to the promotion of the prevention or control of diseases.

487. Even if, contrary to our conclusion, the provision of assistance or alleviation of symptoms is a form of promotion of the requisite kind, there would still be a difficulty for the applicant. It would need to show more than a plausible pathway for its activities in alleviating the symptoms of those contacting it to constitute the promotion of the prevention or control of disease. It would instead have to show that the conditions to which its activities are directed are a form of disease and, given our findings as to the applicant's principal activity, a form of disease resulting from the noise emission of wind farms. It would also have to show that its activities did have a beneficial effect on those to whom they were directed.

488. Yet we have found that the medical evidence does not support the proposition that sound emissions from wind farms directly cause any adverse health effects which may be regarded as a disease. Further, while the applicant did present the evidence of the individuals summarised earlier, it did not adduce medical evidence concerning the symptoms which they reported so as to permit some assessment of them, or of their aetiology. We note that several of the witnesses said that they had sought medical attention or advice, which suggests that medical evidence of some kind should be available. As the applicant did not adduce that evidence, the Tribunal does not have sufficient material on which to conclude that its activities are directed to the alleviation of medical conditions, let alone of medical conditions attributable to the emissions of wind farms.

489. This is not a case in which the beneficial effect of the applicant's activities can be regarded as self-evident. Amongst other things, the evidence contained several references to the possible nocebo effect[370] of activities like those of the applicant. That suggests that a proper assessment of the effect of the applicant's activities, with the assistance of medical and scientific evidence, would also require consideration of this possibility.

[370] See, for example, Exhibit R65.

490. In relation to Item 13, we summarise our conclusions as follows. First, we are satisfied that the applicant's principal activity is the provision of support, assistance and information to individuals and communities. Secondly, that activity does not constitute the promotion of the prevention or control of diseases in human beings.

491. This means that the application insofar as it concerns registration under Item 13 fails. For completeness, we will mention particular grounds of objection which are not encompassed by the above reasons.

492. The applicant challenged the Commissioner's finding that its activities were confined to the effects of sound and vibration produced by wind turbines. We have already accepted that the applicant's activities were not at the relevant time "confined" to the effects of sound and vibration produced by wind turbines. However, as indicated earlier, we consider that that was its principal focus. On our analysis, the fact that some of the applicant's activities also related to other sources of sound and vibration does not by itself have the consequence that the Commissioner's decision was wrong.

493. By ground (b),[371] the applicant complained that an extensive body of research relating to the health impacts and diseases in humans caused by other sources of noise has been ignored. By ground (f), the applicant complained that the Assistant Commissioner should not have relied on some of the studies and literature to which he had referred, at least without qualification, and that he had ignored other studies. Given that we have made our own independent review of the material to which we were directed, it is not necessary to address these grounds.

494. By ground (c), the applicant complained that its concern with "Environmental Sleep Disorder" had been ignored.

495. "Environmental Sleep Disorder" was a diagnosis included in The International Classification of Sleep Disorders, Revised, produced by the American Academy of Sleep Medicine in 2001.[372] It is also apparently embraced within the description "other sleep disorders not due to a substance or known physiological condition", being the description

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[371] See above at [52].

[372] See Exhibit A59.

for diagnosis code F51.8, in the 2016 American version of the International Classification of Diseases.[373]

496. The disorder is said to consist, relevantly, of disturbed sleep for a period of at least three weeks secondary to an environmental factor, including noise. It would potentially therefore apply to anyone whose sleep consistently is disturbed by any noise, for example a barking dog or air conditioner.

497. A later edition of The International Classification of Sleep Disorders published in 2014 acknowledged that the environmental sleep disorder diagnosis was "infrequently employed in the clinical setting and significant controversy exists regarding whether environmentally induced sleep disturbance represents a clinical disorder per se".[374] This edition suggested that "[i]f the clinician determines that an environmental factor is the primary cause of a sleep disturbance, a diagnosis of Other Sleep Disorder may be employed".[375]

498. We do not consider it necessary for present purposes for the Tribunal to enter into this controversy. It is sufficient for us to conclude, as we have concluded, that there is a plausible basis for thinking that there may be some link between wind turbine noise, on the one hand, and sleep disturbance and annoyance, on the other, with consequent effects on human health. The precise medical label for these effects is not the critical matter. The question of the applicant's "interest" is covered by the findings already made.

499. By ground (d), the applicant complained that the Commissioner's consideration of the effects of sound and vibration had been confined, inappropriately, to physiological effects, and had not taken account of the effects on mental health.

500. As will be apparent from our discussion of the evidence, we have considered all the material put forward, including that relating to non-physical effects. We accept that the evidence points to an association and a plausible pathway between WTN and adverse health effects (of a physical nature), mediated by annoyance, sleep disturbance and/or

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[373] See Exhibit A58.
[374] Exhibit A60, p 8.
[375] Ibid.

psychological distress. However, the evidence does not point to an association between WTN and psychiatric illness.

ITEM 7: PROMOTING OR PROTECTING HUMAN RIGHTS

501. The second part of the applicant's application concerns the revocation of its registration (with effect from 1 January 2014) as an Item 7 charity, that is, an entity with a purpose of promoting or protecting human rights.

502. The issue for the Tribunal is whether, as at 1 January 2014, the applicant had that purpose.

503. The ACNC Act incorporates by necessary reference the meaning of the term "human rights" contained in the Charities Act. Section 3 of the Charities Act provides that the term has the meaning given by the *Human Rights (Parliamentary Scrutiny) Act 2011* (Cth) (the Parliamentary Scrutiny Act). That meaning (contained in s 3(1)) is as follows:

> ***human rights*** means the rights and freedoms recognised or declared by the following international instruments:
>
> (a) the International Convention on the Elimination of all Forms of Racial Discrimination done at New York on 21 December 1965 ([1975] ATS 40);
>
> (b) the International Covenant on Economic, Social and Cultural Rights done at New York on 16 December 1966 ([1976] ATS 5);
>
> (c) the International Covenant on Civil and Political Rights done at New York on 16 December 1966 ([1980] ATS 23);
>
> (d) the Convention on the Elimination of All Forms of Discrimination Against Women done at New York on 18 December 1979 ([1983] ATS 9);
>
> (e) the Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment done at New York on 10 December 1984 ([1989] ATS 21);
>
> (f) the Convention on the Rights of the Child done at New York on 20 November 1989 ([1991] ATS 4);
>
> (g) the Convention on the Rights of Persons with Disabilities done at New York on 13 December 2006 ([2008] ATS 12).

504. Section 3(2) of the Parliamentary Scrutiny Act is also relevant. It provides:

> In the definition of ***human rights*** in subsection (1), the reference to the rights and freedoms recognised or declared by an international instrument is to be read as a reference to the rights and freedoms recognised or declared by the instrument as it applies to Australia.

505. The applicant's claim with respect to its promotion or protection of human rights has changed over time. The claim which it pursued in the Tribunal is a more confined claim than that which it advanced before the Assistant Commissioner and the Commissioner.

The applicant's Constitution

506. Earlier in these reasons we set out the statement of the applicant's objects in the Constitutions in force at material times. The Constitution adopted on 8 June 2011, which is set out at [152] above, contained no express reference to human rights. Such an express reference was included in the Constitution adopted on 18 July 2014, as Object (j) which was as follows:

> (j) Provide assistance with preparation of complaints with respect to breaches of human rights. Such breaches of human rights could include but are not limited to breaches of the following Conventions to which Australia is a signatory:
>
> - UN Convention on elimination of racial discrimination
> - UN Convention against torture and other cruel inhuman or degrading treatment or punishment
> - UN Convention on the rights of the child
> - UN Convention on the rights of people with disabilities

507. We are willing to act on the basis that the statement of objects adopted on 18 July 2014 may have reflected a purpose of the applicant which antedated its incorporation into the Constitution. We also note, however, that the reference to human rights was removed from the applicant's Constitution adopted on 24 January 2015. That was the form of Constitution which was in effect as at 23 June 2015 (the date of the Objection Decision).[376] Ms Laurie explained that the reference to human rights had been removed as it had been felt at the time that the applicant's overarching purpose of preventing or controlling diseases encompassed the protection of human rights.[377] Nevertheless, the applicant modified its Constitution again on 26 April 2016, so as to re-insert a reference to human rights.

508. It is possible that the amendment to the applicant's Constitution on 18 July 2014 to incorporate a reference to human rights was responsive to the letter which the applicant

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[376] Statement of Agreed Facts, at [4]-[7].

[377] Exhibit A7, at [188].

had received from the ACNC giving it the opportunity to "show cause" why its registration as an Item 7 charity should not be revoked. However, even if that be so, we do not consider that any inference adverse to the applicant should be drawn on that account.

The claim before the Assistant Commissioner and the Commissioner

509. In its submissions to the Assistant Commissioner, the applicant relied on all seven of the Conventions listed in the definition in the Parliamentary Scrutiny Act.[378] It contended that rights recognised by each of these Conventions were being infringed by the operation of wind turbines. Amongst other things, the applicant contended that sleep deprivation was a form of torture and asserted that public officials were "at risk of criminal charges for torture as a consequence of not taking action in relation to wind turbines".[379]

510. In the submissions in support of its objection to the decision of the Assistant Commissioner, the applicant made express reference only to the International Covenant on Civil and Political Rights (the ICCPR) and the Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (the CAT).[380] It seems, however, that the applicant continued to rely on all seven Conventions. Its submission to the Commissioner was encapsulated in the following passage:

> The infliction of disease on neighbours by industrial operations, whether induced by noise or other means, contravenes Article 7 of [the ICCPR]. If done with the acquiescence of public officials it also contravenes Article 16 of [the CAT] and, in such cases, if it involves the infliction of severe physical or mental pain or suffering it contravenes Articles 1 and 2 of [the CAT].
>
> Thus, diseases induced by industrial noise, whose prevention and control is the purpose of the Waubra Foundation, normally are due to breaches of human rights as stated in those human rights conventions to which Australia is a signatory. So in working to prevent and control disease induced by industrial noise, the Waubra Foundation is acting to promote and protect human rights. The two activities are integrally related, not alternative uses of the Foundation's resources.[381]

511. As can be seen, this was a submission that because the effect of the applicant's activities was (as it asserted) to promote and protect human rights, that also was its purpose, or at least a purpose.

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[378] Exhibit A4, T3 at [132]-[150].

[379] Ibid, at [144].

[380] Ibid, T4/204.

[381] Ibid.

512. The Commissioner considered the applicant's submissions with reference to each of the seven Conventions. Her conclusion was that the applicant had not shown infringements of any of them. Essentially, this was because the Commissioner considered that the weight of the scientific evidence did not establish that emissions from wind farms have adverse effects on human health and because the applicant had not provided evidence of activities which might reasonably demonstrate a purpose of promoting or protecting any of the identified human rights.

The claim concerning human rights in the Tribunal

513. The applicant's SFIC in relation to the claim for registration as an Item 7 charity commenced with the following:

> [81] It is submitted that, in the circumstances of this case, that if the applicant satisfies the requirements for entitlement to registration under Item 13 of the Table at 25-5(5) of the ACNC Act, then it necessarily follows that the applicant is also entitled to registration under Item 7.
>
> [82] As the Human Rights identified below include rights such as "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health"; an institution (or entity) that promotes the prevention or control of diseases in human beings must, as a corollary of that activity, also be "promoting or protecting human rights": this is because the prevention or control of diseases is an antecedent condition to (for example) "the enjoyment of the highest attainable standard of physical and mental health".

514. The applicant went on in the SFIC to identify three International Conventions as being relevant to the question of whether its purposes included a purpose of promoting or protecting human rights. These were the International Covenant on Economic, Social and Cultural Rights (the ICESCR), the ICCPR and the Convention on the Rights of the Child (the CROC).

515. The applicant said in [88] and [89] of its SFIC that its purposes included a purpose of promoting or protecting human rights because it encourages research into, and advocates for, appropriate limits for, and control of, industrial noise and vibration for workers and others exposed to such emissions, thereby promoting or protecting:

(a) "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health"; and

(b) "the right of a child to the enjoyment of the highest attainable standard of health"; and

(c) "steps to achieve the full realization of the above rights [by] promoting 'the prevention, treatment and control of epidemic, endemic, occupational and other diseases'"; and

(d) the "right of everyone (including children) to the protection of the law against arbitrary or unlawful interference with [their] … family or home", namely, the common law right asserted by the applicant to exist permitting action to be taken in nuisance to prevent unlawful interference with the ability to sleep in, use and enjoy a person's home free from noise nuisance.[382]

516. The applicant also said in its SFIC that the determination of whether it had a purpose of promoting or protecting human rights required the Tribunal to consider "whether the current limits and controls on industrial noise or vibration (including wind turbine noise or vibration) in Australia adequately promote or protect the rights expressed in the Articles" of the Conventions on which it relied, and that it would present evidence to demonstrate that those limits and controls are inadequate.[383]

517. To that point, it seemed that the applicant had revised its original position of reliance on the seven International Conventions to only three. Ultimately, however, the applicant's submission (having abandoned Ground of Objection (g)) was confined to Ground of Objection (h) which, for convenience, we will repeat here:

> (h) The conclusion that the applicant did not have the purpose of promoting or protecting human rights was wrong because it ignored the established human right to enjoy the highest attainable standard of physical and mental health and the requirement for proper regulation and enforcement of noise pollution policy to protect, maintain and protect that right as provided by:
>
> (i) Article 12 of the International Covenant on Economic, Social and Cultural Rights (the ICESCR); and
>
> (ii) Article 24 of the Convention of the Rights of the Child (the CROC).

518. Article 12.1 of the ICESCR states:

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[382] Applicant's SFIC, at [89].

[383] Ibid, at [87]-[88].

> The States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health.

519. Article 24.1 of the CROC states:

> States Parties recognize the right of the child to the enjoyment of the highest attainable standard of health and to facilities for the treatment of illness and rehabilitation of health. States Parties shall strive to ensure that no child is deprived of his or her right of access to such health care services.

520. As can be seen, there is a significant overlap between the requirements of these Articles.

521. The applicant's final submissions focused almost entirely on its claim to registration as an Item 13 charity. In relation to its claim to be registered as an Item 7 charity, the applicant said only:

> [61] [B]ased on the evidence outlined above and for the reasons expressed in the applicant's [SFIC], it is submitted that the applicant is also entitled to be registered as a charity under the subtype specified in Item 7 of the Table at 25-5(5) of the ACNC Act, as an entity with a purpose of promoting or protecting human rights.

Consideration

522. For the purposes of resolving this part of the applicant's application, we are prepared to assume in its favour, but without addressing in detail, a number of matters concerning the right to health to which Article 12.1 of the ICESCR and Article 24.1 of the CROC refer. First, that the obligations known as the "tri-partite set of obligations" contained in General Comment No 4 adopted by the Committee on Economic Social and Cultural Rights (the CESCR) are applicable. General Comment No 14 provides:

> The obligation to respect requires States to refrain from interfering directly or indirectly with the enjoyment of the right to health. The obligation to protect requires States to take measures that prevent third parties from interfering with Article 12 guarantees. Finally, the obligation to fulfil requires States to adopt appropriate legislative, administrative, budgetary, judicial, promotional and other measures towards the full realisation of the right to health.

523. Secondly, as stated in the General Comment, the right to health enshrines a right to "conditions necessary for the realisation of the highest attainable standard of health" and that that right extends to:

> the underlying determinants of health, such as access to safe and potable water and adequate supply of safe food, nutrition and housing, healthy occupational *and environmental conditions*, and access to health-related education and information, including on sexual and reproductive health. (Emphasis added)

524. Thirdly, the CESCR has said in relation to Article 12.2(b) of the ICESCR that it encompasses:

> the prevention and reduction of the population's exposure to harmful substances such as radiation and harmful chemicals *or other detrimental environmental conditions* that directly or indirectly impact upon human health. (Emphasis added)

525. We are willing therefore to proceed on the assumed basis that the right to the "highest attainable standard of physical and mental health" requires States, within their resources, to provide for healthy environmental conditions. Accordingly, there is a sense in which those who advocate for healthy environmental conditions can be said to be promoting or protecting human rights.

526. The Commissioner submitted, relying on *Victorian Women Lawyers*[384] to which we referred earlier, that an entity's purpose (in the context of s 25-5(5) of the ACNC Act) should be assessed holistically, having regard to the entity's objects as stated in its Constitution, the history of its formation and the activities which it has undertaken since its formation. We consider this to be the correct approach.

527. Whereas the determination of an entity's principal activity requires, predominantly, consideration of the entity's actual activities, including its day-to-day activities, the determination of an entity's purpose or purposes requires consideration of all the matters from which the purpose or purposes may be inferred. The statement of objects of the entity in its constitution are important in this respect.[385] Naturally, an entity's actual activities will be relevant to the enquiry, as any constitution must be "read in light of the history of its formation and the activities which the entity has undertaken since".[386] Note 1 to s 5 of the Charities Act 2013 refers to these matters as it directs:

> In determining the purposes of the entity, have regard to the entity's governing rules, its activities and any other relevant matter.

528. Neither party suggested that the purpose to which Item 7 refers must be an entity's sole or dominant purpose. We consider that position to be correct. The cases in which there

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[384] *Victorian Women Lawyers' Association Inc v Commissioner of Taxation* [2008] FCA 983; (2008) 170 FCR 318 at [146].

[385] Ibid.

[386] Ibid.

have been some suggestions that a charitable purpose must be a dominant purpose have concerned different statutory contexts.[387]

529. We turn to the particular matters raised by the applicant in its SFIC. We consider that it is neither necessary nor appropriate for the Tribunal, in the discharge of its present function, to consider, let alone determine, whether the currently applicable limits and controls on industrial noise and vibration, including the noise and vibration from wind turbines, are adequate or whether they protect the human rights to which the applicant refers. The assessment of whether the applicant has the requisite purpose does not require such a consideration or determination. Accordingly, we reject the submission contained in [87]-[88] of the applicant's SFIC.

530. We also reject the submission contained in [81]-[82] of the applicant's SFIC. It is not necessary to address the individual elements of the syllogism implicit in those paragraphs because we have held that the applicant does not satisfy the requirements for entitlement to registration as an Item 13 charity.

531. The critical question presently is whether the applicant has "a purpose" of promoting or protecting human rights. Contrary to the applicant's submissions, that question is not to be resolved in its favour by a finding that a consequence of its activities will be the promotion or protection of human rights. Even if its activities do have that effect, there remains the question of whether the applicant has that as a purpose, in other than a nominal or incidental way. Put slightly differently, the applicant cannot be regarded as having a purpose of promoting or protecting human rights if the effect on human rights which it achieves (assuming that to be so) is only an incidental consequence of its pursuit of its actual purposes.

532. The applicant's evidence about its activities in the relevant period which were directly related to the pursuit of human rights was slight. Ms Laurie's evidence on this topic was as follows:

> [99] As time has gone on, the human rights issues have become more and more obvious to ourselves and to low frequency noise sensitised people, who are increasingly asking for our help and assistance to progress the understanding of the related human rights issues and potential breaches.

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[387] See for example, *Law Institute of Victoria v Commissioner of State Revenue* [2015] VSC 604.

> [100] We first became practically involved in the Human Rights issues when we helped a couple of families with advice when they put in complaints to [AHRC] relating to treatment of individuals in their respective families with disabilities living near proposed industrial noise sources.
>
> …
>
> [103] Mr Tony Edney, a recent addition to the Board of the Waubra Foundation has started helping residents to put together detailed statements that could form the basis for formal complaints to the [AHRC]. Many of the residents who have submitted affidavits to the Waubra Foundation have expressed an interest in approaching the [AHRC] directly because they have [lost] faith in the current regulatory framework and do not expect that their interests and human rights will be protected.
>
> …
>
> [108] Accordingly the Foundation has recently (26th April 2016) amended its constitution's objects to include (again) specific reference to human rights so that there is no possible confusion about the role of the Foundation in this area. The constitution now has the additional phrase: "to promote and protect human rights where those human rights are, or may be, adversely affected because of industrial sound and vibration".[388]

533. We note that the very large volume of documentary material provided by the applicant, whether directly to the Tribunal or via the T-documents, evidences very little activity directly related to the pursuit of human rights.

534. The evidence of Ms Laurie quoted above suggests that the focus of the applicant's activities, insofar as they have concerned the pursuit of human rights, has been in providing assistance to individuals in making complaints to the AHRC. Further, the activities of Mr Edney described by Ms Laurie in [103] of her affidavit appear to be relatively recent and, we infer, have occurred after 1 January 2014. Activity of this kind reflects Object (j) in the Constitution adopted on 18 July 2014.

535. We note that that object contains no express reference to the ICESCR on which the applicant now relies. Perhaps the more significant consideration is that when in July 2014 the applicant did address the inclusion of an object concerning human rights in its Constitution, it confined that object to the provision of assistance with respect to the preparation of complaints, rather than including an object that it had a purpose of promoting or protecting human rights more generally. There is no basis upon which the Tribunal could infer that the applicant had any wider purpose as at 1 January 2014. On

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[388] Exhibit A7.

the contrary, Ms Laurie's evidence tends to confirm the limited nature of the applicant's interest.

536. We have the strong impression, and so find, that the promotion or protection of human rights, *per se*, is not one of the applicant's purposes, at least in a way which is other than incidental to its actual purposes. The applicant would be pursuing its concerns about the health effects of wind farms even in the absence of the International Conventions and the rights to which they refer. Our impression is that the applicant has fastened upon the rights contained the International Covenants and, in particular, in the ICESCR and the CROC, as a means of bolstering its submissions and advocacy with respect to the health effects of wind farms which it perceives.

537. In those circumstances, we are not willing to find that the applicant does have a purpose of promoting or protecting human rights of the kind to which Item 7 refers.

SUMMARY

538. For the reasons set out above, we consider that the applicant was not entitled to be registered as an Item 7 or as an Item 13 entity under s 25-5 of the ACNC Act. As noted earlier, it was not suggested that the Tribunal should exercise any residual discretion in the applicant's favour. Accordingly, the Commissioner's Objection Decision made on 23 June 2015 is affirmed.

DECISION

539. The decision under review is affirmed.

I certify that the preceding 539 (five hundred and thirty-nine) paragraphs are a true copy of the reasons for the decision herein of The Honourable Justice White, Deputy President and Deputy President K Bean

..... [Sgd] .....

Associate

Dated: 4 December 2017

Dates of hearing:	**5 – 8, 12 – 16, 19, 21 and 22 September 2016**
Counsel for the Applicant:	**Mr P Quinn** **Nick Xenophon & Co Lawyers**
Counsel for the Respondent:	**Ms J Batrouney QC** **Commissioner of Australian Charities and Not-for-profits Commission**

Failure to properly review wildfire risk and public safety

Dr Michael Crawford

20th March 2018

The Department of Planning appears to have obtained no explicit advice from the NSW RFS about the potential public safety consequences of the proposed Bango wind farm and particularly its impact on aerial fire fighting in the area and how that would affect the ability to protect life and property. The advice received from the RFS appears focused on the ability of RFS personnel to conduct operations in such a way as to maintain their safety and not that of the community. It appears to be a situation where the agency (RFS) with expertise to evaluate the specific, on-the-ground impacts on public safety in the Bango location, failed to make such an evaluation; and the agency with no such expertise (DPE) nonetheless said there will be no adverse impact. This could be readily seen as reckless indifference to public safety, conveniently blurred between two government agencies, with no one actually taking responsibility when people and properties are destroyed.

FAILURE TO PROPERLY REVIEW WILDFIRE RISK AND PUBLIC SAFETY

A number of objectors to the Bango proposal expressed reasonable concerns about the exacerbation of wildfire risk to themselves and their properties were the wind farm to be built and the adverse impact on fire fighting posed by the wind farm, as it may affect aerial fire fighting, which is often critical in fighting wildfires.

Rural people know that fire fighting aircraft often deliver their payload 30 or 40 metres above the ground for maximum effect, and this is a small fraction of the 200 metre height proposed for the Bango turbines. They also know from experience that this often occurs in very smoky conditions, impairing visibility in the surrounding areas which may extend the territory which aircraft need to avoid.

DPE's assessment report acknowledges that there were many concerns about the impact on bushfire risk and firefighting. It then says [1]:

> "However, the NSW Rural Fire Service (RFS) did not raise any concerns about the project's impacts on aerial bushfire fighting"

and

> "the Department is satisfied that the bushfire risks associated with the project are not significant and can be effectively managed subject to implementation of the proposed mitigation measures."

It appears nowhere has the RFS explicitly told the Department that it has considered the impact of these turbines on fire fighting and that they will not adversely affect fire fighting effectiveness and adversely affect public safety. The Department appears to have assumed that without evidence. DPE's report does quote:

> "The Department also notes that in its Wind Farm and Aerial Firefighting Information Sheet, the RFS states that the presence of a wind farm would not stop it from fighting a fire and it would deal with wind farms in the same way it deals with other potential hazards, such as powerlines, radiocommunication towers, mountains or valleys." [2]

Saying that something will not stop fire fighting is not the same as saying it will not degrade fire fighting. When the RFS says it will "deal with wind farms in the same way it deals with other potential hazards", it is saying that it will avoid them as it does other hazards. That is right and proper in terms of protecting fire fighters (whose protection is the number one priority for the RFS), but doing so means they will alter fire fighting in ways that necessarily make it less effective.

Unfortunately we were unable to find a copy of the actual communications from the RFS to DPE in relation to Bango. However, we have obtained copies of RFS documents related to the Jupiter wind farm proposal. We will proceed on the assumption that the RFS has treated Bango wind farm essentially the same as Jupiter wind farm. If the IPC is able to obtain copies of all documents relevant to Bango from the RFS and they show a different approach than for the Jupiter wind farm, then the IPC can adjust the conclusions appropriately.

The public safety risk depends on local fire susceptibility, terrain, population density, means of access, and location of turbines relative to dwellings and to means of access which may be

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[1] *State Significant Development Assessment Bango Wind Farm (SSD 6686)*, Department of Planning & Environment, February 2018, p. 60.

[2] *State Significant Development Assessment Bango Wind Farm (SSD 6686)*, Department of Planning & Environment, February 2018, p. 60.

threatened by fire. It is impossible to make an informed statement about the impact on the risk to the community without actually examining those things in each case, i.e. doing an evaluation for the particular locality.

In fact, in relation to Jupiter (and presumably Bango) the NSW RFS conducted **NO** reviews or analysis of the specific locality and of the potential impact on fire fighting or risks to the residents or properties in that locality. We know this due to a response provided to a GIPA request lodged with the RFS and answered 25 January 2018 (attached).

The detailed GIPA request to the RFS is shown below.

I request copies of the following documents:

1. Any analysis or assessment conducted by or for the RFS ***specifically in relation to the proposed Jupiter wind farm***:
    a. Evaluating the potential impact of the wind farm on fighting fires and protecting lives and property in the general vicinity of that wind farm, particularly, but not exclusively, in the Boro and Duckfield areas and along Boro Road, including the number of properties and lives for which wildfire risk may be increased.
    b. Evaluating the area from which aerial firefighting appliances, including supertankers, may be effectively excluded around the vicinity of the wind farm in thick smoke conditions, and the consequences for effective fighting of wild fires in the general vicinity of the wind farm.
    c. Evaluating the restrictions that may need to be placed on the use of ground crews particularly in the Boro area given the terrain, vegetation and limited access, should aerial support be restricted.
2. Any analysis or assessment prepared by the RFS, or used by the RFS, evaluating the downwind effects of wind farms on fuel load and flammability, and the downwind effects on micro-climate that may exacerbate wildfire behaviour or the difficulty of fighting wildfires, drawing on research sources such as those cited below (*Research Articles re Wind Farms, Microclimate and Vegetation*).
3. Any documents applying the analysis identified under point 2 to evaluation of the potential wildfire consequences specifically of the proposed Jupiter wind farm.

Note. Reference to the proposed Jupiter wind farm means the proposed wind farm south of Tarago which is being assessed by the Department of Planning & Environment as SSD 6277.

The RFS released all documents it claimed relevant to the request. There were only two documents, aside from a DPE email to the RFS requesting input about the Jupiter proposal.

One of them (RFS Ref S14.0001 dated 6 March 2017) contains a set of consent condition recommendations directed at protecting the wind farm, fire fighters at the wind farm, and "minimising" (not preventing) the risk that the construction and/or operation of the wind farm would create a fire that could spread from the site.

There is nothing in that document relating to assessment of changed fire fighting risk in the area around the wind farm and potential impact on risk for members of the community. There is nothing in the document referring to specific examination of the locality, the nature of

access, the local wildfire risks, the distribution and density of population. It is simply generic advice about protecting a property (the wind farm) and attempting to reduce the incidence of fire being started by its operation.

It does state "any fire fighting activities in the vicinity of the project by either fixed wing or rotary wing aircraft would need to be conducted in consideration of the location of the Wind Turbine Generators and monitoring towers." and "Any fire fighting operations in close proximity to wind turbines will be managed in the same way as any other potential hazard in accordance with Standard Operating Procedures."

Those two statements are an admission that if the wind farm is built, aerial fire fighting tactics in its vicinity would be different than in the absence of the wind farm, and that those tactics would be directed to protecting the air crew and aircraft. There is no mention and certainly no evaluation of the potential consequences for the success of fire fighting in the area and the extent to which that may affect risks to the local community.

The second document is a skimpy AFAC production titled *Wind Farms and Bushfire Operations*, dated 30 October 2014. That document is also referenced in the RFS letter to DPE about Jupiter wind farm. That document also contains only generic statements. Its reference to aerial fire fighting is once again simply in relation to the protection of aerial fire fighting crews and not about what may be the fire fighting consequences and effect on communities.

Importantly, the document contains several disclaimers:

> "AFAC does not accept any responsibility for the accuracy, completeness or relevance of this document or the information contained in it, or any liability caused directly or indirectly by any error or omission or actions taken by any person in reliance upon it."

and

> "Use of this document by AFAC member agencies, organisations and public bodies does not derogate from their statutory obligations. It is important that individuals, agencies, organisations and public bodies make their own enquiries as to the currency of this document and its suitability to their own particular circumstances prior to its use."

So the AFAC document says it makes no guarantees of accuracy and, importantly, it warns agencies such as the NSW RFS and DPE that they cannot rely on the document but ***must*** make their own enquiries in relation to the particular circumstances.

The GIPA response shows that the NSW RFS did not conduct any evaluation of the specific circumstances about the Jupiter wind farm, its locality and consequent fire fighting and public safety risks in the area. It appears that the NSW RFS Commissioner has been negligent in offering advice to DPE without any attempt to consider the potential impact on public safety in relation to the Jupiter wind farm (and by implication the Bango wind farm).

DPE itself appears to have no particular expertise in evaluating wind farm fire risk impact on an area (which is why it asked the RFS). Consequently, given that the RFS failed to perform any analysis, the Department had no basis for claiming that the wind farm would not exacerbate effective wildfire risks to members of the local community and their properties or that those risks are actually manageable without material detriment to the community.

The fact that wind farms are very tall, moving structures necessitates some impact on aerial fire fighting techniques. That also has some effect on ground fire fighting, since it may become too dangerous to put a truck into certain areas if they cannot be backed up by aerial support if on-the-ground circumstances change adversely.

Thus the Bango wind farm proposal will adversely affect fire fighting in its vicinity. Neither DPE nor the RFS has provided any actual analysis to the IPC to demonstrate that the effect will be such that the IPC could deem it acceptable. Consequently, it would be reckless for the IPC to approve the wind farm in the absence of actual evidence and actual independent evaluation of the consequences for wildfire risk and public safety for members of the local community.

NSW RURAL FIRE SERVICE

Our reference: **R17/4099**

25 January
2 February 2018 KK

Dear Dr Crawford

Notice of Decision – *Government Information (Public Access) Act 2009* (GIPA Act)

I am writing to advise you of the outcome of your recent application to access information held by the NSW Rural Fire Service (NSW RFS) regarding any assessment or analysis conducted by the NSW RFS in relation to the proposed Jupiter wind farm.

Enclosed is the Notice of Decision which outlines my determination.

In summary, two documents were identified as falling within the scope of your application. I have decided to release the documents to you in full. The documents are enclosed with this letter.

Your application took approximately three hours to process. Your $30.00 application fee covered the first hour and I have decided to waive further charges.

If you do not agree with this determination, you may wish to exercise your rights of review. These rights and the steps you may take to exercise them are detailed in the attached fact sheet published by the Information and Privacy Commission.

If you have any questions about this process, you are welcome to the NSW RFS Officer on (02) 8741 5133 or contact me on [redacted]

Yours sincerely

[redacted]

Harinniya Bhogal

Manager, Legal and Government Information
Right to Information Officer

Encl:
1. Notice of Decision, Schedule of Documents and copies of documents
2. IPC Fact Sheet – Your rights to accessing government information in NSW
3. Table of processing charges
4. Cheque receipt $30.00

Postal address
NSW Rural Fire Service
Locked Bag 17
GRANVILLE NSW 2142

Street address
NSW Rural Fire Service
15 Carter Street
LIDCOMBE NSW 2141

www.rfs.nsw.gov.au
T (02) 8741 5110
F (02) 8741 5118
E legal@rfs.nsw.gov.au

Government Information (Public Access) Act 2009

NOTICE OF DECISION

Applicant:	**Dr Michael Crawford**
File Ref:	**R17/4099**
Decision maker:	**Harinniya Bhogal** **Manager, Legal and Government Information**
Date of decision:	**25 January 2018**

Table of Contents

1. Summary of access application

On 8 December 2017 the NSW Rural Fire Service (NSW RFS) received your access application under the *Government Information (Public Access) Act 2009* (GIPA Act). You asked for information regarding any assessment or analysis conducted by the NSW Rural Fire Service (NSW RFS) in relation to the proposed Jupiter wind farm.

2. Decision

I am authorised by the principal officer, for the purposes of section 9(3) of the GIPA Act, to decide your access application.

Under section 58(1)(a) of the GIPA Act, you are provided with:

- access in full to documents 1 and 2, as there is no overriding public interest against disclosure of the information.

This Notice of Decision outlines the reasons for this decision and any important questions of fact underlying those reasons. The general nature and format of the records is outlined in the Schedule of Documents.

You can ask for a review of this decision. For details about how to do so, see part 8 of this Notice.

3. Searches for information

Under the GIPA Act, an agency must conduct reasonable searches for the government information requested. A search of NSW RFS records was undertaken by the Operational Services Directorate to identify all government information falling within the scope of your request. The searches included Incident Control On-line (ICON) and Bushfire Risk Information Management System (BRIMS).

The documents are fully described and listed in the Schedule of Documents attached to this Notice of Decision.

4. The public interest test

Under section 9(1) of the GIPA Act, you have a legally enforceable right to access the information requested, unless there is an overriding public interest against disclosure.

Further, under section 5 of the GIPA Act, there is a presumption in favour of disclosing government information unless there is an overriding public interest against disclosure.

To decide whether or not there is an overriding public interest against disclosure of the information requested, the public interest test, as set out in section 13 of the GIPA Act, was applied, by:

(a) identifying any public interest considerations in favour of disclosure;

(b) identifying any relevant public interest considerations against disclosure; and

(c) deciding where the balance between them lies.

4.1 Public interest considerations in favour of disclosure

Under section 12(1) of the GIPA Act, there is a general public interest in favour of disclosing government information. The note at section 12(2) of the GIPA Act sets out some examples of other public interest considerations in favour of disclosure. However, an agency is not limited to those considerations in deciding your application.

The following considerations in favour of disclosure apply to the information falling within the scope of this application:

- there is a presumption in favour of the disclosure of government information under section 5;
- there is a general public interest in favour of the disclosure of government information under section 12(1) of the GIPA Act; and
- disclosure of the information could reasonably be expected to inform the public about the operations of agencies and, in particular their policies and practices for dealing with members of the public, under section 12 (2)(b) of the GIPA Act.

4.2 Personal factors of the application

Personal factors of your application are also taken into account in accordance with section 55 of the GIPA Act. It is considered there are no personal factors relevant in applying the public interest test.

4.3 Public interest considerations against disclosure

When applying the public interest test, the public interest considerations against disclosure that can be taken into account are limited to those set out in the table to section 14 of the GIPA Act.

It is considered that disclosure of information contained in some of the documents could reasonably be expected to:

- prejudice any person's legitimate business, commercial, professional or financial interests – section 14(3) Table 4(d)

Section 14(3) Table 4(d) – prejudice any person's legitimate business, commercial, professional or financial interests

Some of the documentation falling within the scope of the application contains the business information of third parties. Business information contained in these documents includes information relating to the business interests of members of the public.

Accordingly, the considerations against disclosure at section 14(3) Table 4(d) applies to some of the information contained in documents 1 and 2.

4.4 Consultation

The information you have requested includes information relating to the business interests of a third party. Given that the business information of a third party was contained in the information you have sought, consultation with the third party was required prior to releasing the information under section 54 of the GIPA Act.

There were no objections to the release of the information. This has been taken into consideration in applying the public interest as outlined below at section 4.5.

4.5 Balancing the public interest test

The relevant public interest considerations in favour of and against disclosure of the information you requested have been considered.

It is noted that information relating to the Jupiter wind farm is already publicly available on NSW Planning and Environment website at the link: http://www.majorprojects.planning.nsw.gov.au/?action=list_submissions&search=&job_id=6277&title=EIS%20-%20Website%20Submissions&type=6&page=2

It is further noted that during the above consultation, the third party did not object to the release of information, including information relating to business interests. Accordingly, the considerations against disclosure do not hold significant weight.

Noting the above in applying the public interest test, and after balancing the interests in favour of disclosure and non-disclosure, it is decided to release documents 1 and 2 in full as there is no overriding public interest against disclosure.

5. Access

In accordance with section 72(1)(b) of the GIPA Act, enclosed is a copy of the records containing the information.

6. Processing charges

Under sections 64(1) and (2) of the GIPA Act, an agency may require an applicant to pay charges at a rate of $30.00 per hour, for the time spent processing an access application.

Your application took approximately three hours to process. The application fee of $30.00 counts as payment of one hour of the processing charges. Further charges are waived.

7. Disclosure log

If information released under a formal access application may be of interest to other members of the public, an agency must record details about the application in its Disclosure Log (sections 25 and 26 of the GIPA Act).

If information that would be of interest to other members of the public is released in response to a formal access application, an agency must record certain details about the application in its 'disclosure log' (under sections 25 and 26 of the GIPA Act).

In the email acknowledging receipt of your valid application, sent on 15 December 2017, you were advised about the disclosure log. You were also advised of your right to object to the inclusion of details about your application in the disclosure log, in certain circumstances (for example, if you seek access to your own personal information).

You did not object to details about your application being included in the disclosure log.

It is decided that the information may be of interest to other members of the public. The NSW RFS will therefore record the following details in its disclosure log, which is publicly available on the NSW RFS website:

- the date on which your access application was decided (the date of this Notice of Decision)
- a description of the information released
- whether that information is, or will be available to other members of the public
- if so, how it can be accessed.

The management of bush fire related risks on and around the land identified in your application has been the subject of prior community interest and debate.

This decision is reviewable under section 80(m) of the GIPA Act (see part 8 of this Notice for information about your review rights).

8. Review rights

If you disagree with any of the decisions in this Notice that are reviewable, you may seek a review under Part 5 of the GIPA Act. Before you do so, you are encouraged to contact the NSW RFS to discuss your concerns. Contact details are provided below.

There are three avenues for review:

- internal review by a senior NSW RFS officer,
- external review by the Information Commissioner, and
- external review by the NSW Civil and Administrative Tribunal (NCAT).

You have 20 working days from the date of this Notice to apply for an internal review. If you would prefer to have the decision reviewed externally, you have 40 working days from the date of this Notice to apply for a review by the Information Commissioner or NCAT.

For your information, enclosed with this Notice is a fact sheet published by the Information and Privacy Commission NSW (IPC) which details your review rights under the GIPA Act.

You will also find useful general information and answers to frequently asked questions by contacting the IPC on 1800 IPC NSW (1800 472 679) or visiting the IPC website: www.ipc.nsw.gov.au

9. Further information

If you have any questions about this Notice or would like any further information on your rights of review, please contact me by telephone on (02) [redacted]

[redacted]

Harinniya Bhogal
Manager, Legal and Government Information

Schedule

No.	Description of record that contains the information	Format of record	Location of record in agency	Released or withheld	Relevant public interest consideration(s) against disclosure
1.	Email from NSW Planning & Environment (1 page)	Printed document	Operational Directorate	Release in full	**Section 14(3) Table 4(d)** – prejudice any person's legitimate business, commercial, professional or financial interests
2.	Letter to NSW Planning and Environment dated 6 March 2017 (3 pages) **Attachment:** AFAC Wind Farms and Bushfire Operations Position Version 2.0 30 October 2014 (6 pages)	Printed document	Operational Directorate	Release in full	**Section 14(3) Table 4(d)** – prejudice any person's legitimate business, commercial, professional or financial interests

Table of Processing Charges

Applicant name: Dr Michael Crawford

Re: Jupiter Wind Farm

Application number: R17/4099

information and privacy commission
New South Wales

Your review rights under the GIPA Act

Fact sheet

June 2014

The right to information system in NSW aims to foster responsible and representative government that is open, fair and effective.

You have the right to request a review of certain decisions made by government agencies about the release of information under the *Government Information (Public Access) Act 2009* (GIPA Act):

a) a decision that an application is not a valid access application

b) a decision to transfer an access application to another agency, as an agency-initiated transfer

c) a decision to refuse to deal with an access application (including such a decision that is deemed to have been made)

d) a decision to provide access or to refuse to provide access to information in response to an access application

e) a decision that government information is not held by the agency

f) a decision that information applied for is already available to the applicant

g) a decision to refuse to confirm or deny that information is held by the agency

h) a decision to defer the provision of access to information in response to an access application

i) a decision to provide access to information in a particular way in response to an access application (or a decision not to provide access in the way requested by the applicant)

j) a decision to impose a processing charge or to require an advance deposit,

k) a decision to refuse a reduction in a processing charge

l) a decision to refuse to deal further with an access application because an applicant has failed to pay an advance deposit within the time required for payment

m) a decision to include information in a disclosure log despite an objection by the authorised objector (or a decision that the authorised objector was not entitled to object).

You generally have three review options.

1. Internal review

You have **20 working days** after the notice of a decision has been posted to you to ask for an internal review by the agency that made the decision.

If a Minister or their personal staff, or the principal officer of an agency made the decision, you cannot ask for an internal review, but you can ask for an external review (see below).

The review must be carried out by an officer who is no less senior than the person who made the original decision. The review decision must be made as if it was a fresh application.

There is a $40 fee for an internal review application. No fee applies for an internal review if the decision is a 'deemed refusal' because the agency did not process your application in time or the internal review is conducted because the Information Commissioner has recommended the agency reconsider its decision under section 93 of the GIPA Act. In this case, you cannot be charged any review fee.

The agency must acknowledge your application within **five** working days of receiving it. The agency must decide the internal review within **15** working days (this can be extended by **10** working days if the agency has to consult with a third party, or by agreement with you).

2. External review by the Information Commissioner

If you disagree with any of the decisions listed above, you can ask for a review by the Information Commissioner.

If you are the person applying for access to information, you do **not** have to have an internal review of the decision before asking the Information Commissioner to review it.

If you are not the access applicant, you must seek an internal review before applying for review by the Information Commissioner. However, if an internal review cannot be sought (if a Minister or their personal staff, or the principal officer of an agency made the decision), you can seek a review by the Information Commissioner.

You have **40 working days** from being notified of the decision to ask for a review by the Information Commissioner.

On reviewing the decision, the Information Commissioner can make recommendations about the decision to the agency.

Note: You cannot ask the Information Commissioner to review a decision that has already been reviewed by the NSW Civil and Administrative Tribunal (NCAT).

3. External review by the NSW Civil and Administrative Tribunal (NCAT)

If you disagree with any of the decisions listed above, you can ask for a review by NCAT. You do not have to have the decision reviewed internally, or by the Information Commissioner before applying for review by NCAT.

You have **40 working days** from being notified of the decision to apply to NCAT for review. However, if you have applied for review by the Information Commissioner, you have **20 working days** from being notified of the Information Commission's review outcome to apply to NCAT.

For more information

Contact the Information and Privacy Commission NSW (IPC):

Freecall: 1800 472 679
Email: ipcinfo@ipc.nsw.gov.au
Website: www.ipc.nsw.gov.au

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From: [redacted]
Sent: Tuesday, 29 November 2016 12:59 PM
Subject: Jupiter Wind Farm - State Significant Development Application (SSD 6277)

EPYC Pty Ltd has submitted an application for Jupiter Wind Farm (SSD 6277).
The proposal includes:

- construction and operation of a large-scale wind farm with up to 88 wind turbines each of 173 metres in height; and
- associated infrastructure including a substation, a permanent operations and maintenance building, access roads, overhead and underground transmission lines, concrete batching plants and temporary construction compounds.

The application and environmental impact statement (EIS) will be on public exhibition from **Wednesday 30 November 2016** until **Wednesday 15 February 2017.**

The EIS may be viewed on the Department's website at the commencement of the exhibition period (http://majorprojects.planning.nsw.gov.au/page/on-exhibition/).

I invite you to comment on the proposal, including advice on recommended conditions of consent, by **Wednesday 15 February 2017.**

Should you have any enquiries about the project, please contact Nicole Brewer on [redacted]

Nicole Brewer
Team Leader | Resource Assessments | Planning Services
Level 22, 320 Pitt Street | GPO Box 39 | Sydney NSW 2001
T [redacted] E [redacted]

****My regular work days are Tuesday, Thursday and Friday**

2

NSW RURAL FIRE SERVICE

Nicole Brewer
Team Leader
Resource Assessments/Planning Services
NSW Planning and Environment
GPO BOX 39
SYDNEY NSW 2001

Your reference: SSD 6277

Our reference: S14.0001

6 March 2017

Dear Madam,

PROPOSAL : Jupiter Wind Farm - Environmental Impact Statement

Reference is made to correspondence dated 29 November 2016 seeking comments on the Environmental Impact Statement prepared in relation to the above State Significant Development in accordance with the *Environmental Planning and Assessment Act 1979.*

The New South Wales Rural Fire Service (NSW RFS) has reviewed the information provided, including the Bush Fire Risk and Hazard Assessment (Appendix N) prepared by EPYC Pty Ltd (dated 2016_F02) and provides the following recommendations;

Asset Protection Zones

Intent: The intent of this measure is to :

- *minimise the risk that a bush fire will damage a wind turbine by providing sufficient space and maintain reduced fuel loads, so as to ensure radiant heat levels are below critical limits and to prevent direct flame contact with structures; and*
- *minimise the risk that the construction and/or operation of the wind farm will create a fire that could spread from the site.*

1. Asset Protection Zones (APZ's) are to be established around each structure and building to prevent direct flame contact from the hazard and a minimum APZ of 10m is required around each tower and a minimum 20m APZ (including a defendable space) will also be provided around each substation and compound.

2. The APZ must be free of surface fuel and elevated fuel and should have minimum canopy.

3. In addition to the above, APZ's are to be maintained for the operating life of the building and structures in accordance with *Planning for Bush Fire Protection 2006* and the NSW Rural Fire Service document titled *Standards for Asset Protection Zones*

Postal address
NSW Rural Fire Service
Records Management
Locked Bag 17
GRANVILLE NSW 2141

Street address
NSW Rural Fire Service
Planning and Environment Services (East)
42 Lamb Street
GLENDENNING NSW 2761

T 1300 NSW RFS
F (02) 8741 5433
E csc@rfs.nsw.gov.au
www.rfs.nsw.gov.au

Fire Management Plan

Intent: The intent of this measure is to :

- *ensure fire safety for fire fighting personnel, workers and visitors during the construction and operation phase; and*
- *ensure there is appropriate fire fighting equipment and water on site to provide an operational response to a bush fire; and*
- *provide for consultation with NSW RFS District with regard to operational responses.*

4. Prior to the commencement of works, the proponent shall prepare and implement a Bush Fire Management and Response Plan for the site. The proponent shall consult with NSW RFS in the preparation of this plan. The plan shall provide measures which address the following matters;

    a) details of the internal road and APZ network.
    b) where locked gates are proposed, procedures and/or systems to ensure access for fire fighters.
    c) prevention of fires igniting during the construction and operation phase.
    d) proposed management to limit the spread of fire within the site.
    e) procedure for an operational response for fire suppression and mitigation in and around the site and the response to emergencies in the vicinity of the site.
    f) maintenance of the required Asset Protection Zones around all buildings on site.
    g) actions to minimise the risk of bush fire on the site.
    h) details of water supply available including access to the water supply.
    i) identification of work which may increase the risk of ignition during the bush fire danger period and details of when this work should not be carried out.
    j) process for the notification of the NSW Rural Fire Service District when works are to be carried out during the bush fire danger period.
    k) procedures for the emergency management of staff and visitors to the site.
    l) a program for the monitoring and reporting on the effectiveness of the above measures.
    m) details of the location of the Wind Turbine Generators and monitoring towers must be made available to the NSW RFS.

Access

Intent: The intent of this measure is to:

- *provide safe operational access to structures and water supply for emergency service; and*
- *to provide safe access to/from the public road system for fire fighters and staff during fire fighting operations .*

5. An internal road network plan shall be prepared and will include the following;

    a) details of the location of the internal road network within the site; and
    b) constructed road should be a minimum of 4.5m in trafficable width (1m clearance on either side) with a minimal vertical clearance of for metres to any overhanging obstructions, including tree branches.
    c) roads and bridges should be constructed to a standard so that they are accessible in all weather conditions and capable of accommodating a vehicle of 15 tonnes for the trafficable road width;

d) dead end roads should incorporate a loop around any structure or incorporate a turning circle with a minimum 12m outer radius.
e) curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress
f) the minimum distance between inner and outer curves is six metres
g) the cross fall is not more than 10 degrees.
h) maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.

(Note: some short constructions in the access may be accepted where they are not less than the minimum 3.5m and extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed.

Water, Electricity and Gas

Intent: The Intent of this measure is to;

- *provide adequate serves of water for the protection of structures during and after the passage of a bush fire and tom manage the spread of fire from the site.*

6. The fire management plan shall include;

    - details of the location and availability of water supplies; and
    - measures to the water supply that are easily accessible and located; and
    - above ground tanks are to be manufactured of concrete or meal and raised tanks must have their stands protected. Plastic tanks are not to be used; and
    - suitable connections for fire fighting purposes are made available .

It is noted that an aeronautical impact assessment report is included in the documentation which states that "any fire fighting activities in the vicinity of the project by either fixed wing or rotary wing aircraft would need to be conducted in consideration of the location of the Wind Turbine Generators and monitoring towers." The location of the wind turbine generators and monitoring towers must be made available to the NSW RFS.

Please note that the NSW Rural Fire Service has worked with other fire fighting agencies in the Australasian Fire and Emergency Service Authorities Council (AFAC) in the development of a national position in relation to wind turbines and bush fire operations. This document is attached for your information.

Any fire fighting operations in close proximity to wind turbines will be managed in the same way as any other potential hazard in accordance with Standard Operating Procedures.

If you have any queries regarding this advice, please contact Amanda Moylan - Team Leader, Development Assessment and Planning on 02 4472 0600.

Yours sincerely,

[redacted]

Jeff Lucas
Director, Planning and Environment Services

afac

Australasian Fire and Emergency Service Authorities Council

Wind Farms and Bushfire Operations

POSITION

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1 Introduction

Wind power is a rapidly expanding mode of renewable energy production in Australia with installed capacity doubling in the past five years. As of September 2013, Australia has 64 wind farms with an installed capacity of 3058 megawatts (MW), with another ten wind farms under construction.

The increasing number of wind farms makes it important for AFAC member agencies to clarify their position and to identify those issues important for their operations in and around these facilities.

2 Purpose

This is a position to state AFAC member agencies attitude towards wind farms and their development. It aims to clarify the risks in order to inform stakeholders including regulators, members of the community and the wind farm industry.

3 Scope

The scope of this paper is limited to the issues relating to planning for bushfire prevention, preparedness, response and to recovery operations in and around existing and planned wind farms.

It excludes the environmental, social and economic issues associated with wind farms. It does not provide any judgments on the values or otherwise of wind farms.

4 Position

Bushfire management issues are best treated at the planning stage of a wind farm project. This includes the impact of bushfires on the wind farm and the potential for fires to start within the development boundaries. Local planning controls are in place to regulate these issues with respect to any infrastructure development and some local planning controls refer specifically to wind farms.

Wind monitoring towers associated with wind farm investigations and planning can be very much taller than the planned turbines and can be less visible. The location and height of monitoring towers should be noted during aerial firefighting operations.

Wind farms can interfere with local and regional radio transmissions by physical obstruction and radio frequency electromagnetic radiation. Any interference can be minimised or eliminated though appropriate turbine siting at the planning stage and by moving away from the tower if experiencing local interference during operations.

Wind farms are an infrastructure development that must be considered in the preparation of Incident Action Plans for the suppression of bushfires in their vicinity. These considerations are routine and wind farms are not expected to present elevated risks to operations compared to other electrical infrastructure.

Aerial fire fighting operations will treat the turbine towers similar to other tall obstacles. Pilots and Air Operations Managers will assess these risks as part of routine procedures. Risks due to wake turbulence and the moving blades should also be considered. Wind turbines are not expected to pose unacceptable risks.

Wind farms are not expected to adversely affect fire behaviour in their vicinity. Local wind speeds and direction are already highly variable across landscapes affected by turbulence from ridge lines, tall trees and buildings.

Turbine towers are not expected to start fires by attracting lightning.

Turbines can malfunction and start fires within the unit. Automatic shutdown and isolation procedures are installed within the system. Although such fires may start a grass fire within the wind farm, planning for access and fire breaks can reduce the likelihood of the fire leaving the property. This risk from such fires is less than that of many other activities expected in these rural environments.

Wind farms may operate on days of Total Fire Ban subject to relevant national, state and territory legislation.

Liaison with wind farm operators and energy industry representatives during and after bushfires should aim to ensure minimal disruption to generation capacity and rapid resumption of essential services to the community.

5 Supporting Documentation

There's power in the wind: national snapshot.
Clean Energy Council, April 2012

There's power in the wind: fact sheet.
Clean Energy Council, June 2011

Both sourced from
http://www.cleanenergycouncil.org.au/resourcecentre/factsheets.html
on 29 August 2013

Emergency Management Guidelines for Wind Farms
Country Fire Authority, April 2007

Fact Sheet 10. Wind Farming, Electromagnetic Radiation & Interference.
Australian Wind Energy Association.
Sourced from
http://www.synergy-wind.com/documents/10Electromagnetic.pdf
9 September 2013

Fundamentally Invalid Assessments re Noise and Health Impacts

Dr Michael Crawford

20th March 2018

A number of local residents objected to the Bango proposal on the grounds of noise and health impacts. The methodology used by the developer and by DPE in its guidelines to measure noise impact has been invalidated by recent findings of a Federal Administrative Appeals Tribunal. The Tribunal also found there is an established pathway from wind farm noise to serious adverse health outcomes. Consequently the IPC cannot rely on noise assessments provided by the developer or any made by DPE using its own guidelines. Nor is the IPC able to accept any consent conditions proposed by DPE or EPA, based on existing policy, as providing adequate protection from harm for the community. Therefore, any decision by the IPC deeming noise from Bango wind farm to be "acceptable" or deeming noise consent conditions based on current guidelines to be adequate to protect the community would be a willful disregard of evidence, procedurally unfair and indicate bias.

Contents

Summary

A number of local residents objected to the Bango proposal on the grounds of noise and health impacts. The developer has claimed there is no problem. DPE has asserted that the noise level will be acceptable. However, the methodology used by the developer and by DPE in its guidelines to measure noise impact has been invalidated by recent findings (December 2017) of a Federal Administrative Appeals Tribunal.

Further, the AAT explicitly found that wind farms emit sound which causes annoyance ***and*** "annoyance of the kind which is generated (often associated with psychological distress and sleep disturbance), is a recognised pathway to a range of adverse health outcomes, including hypertension and cardiovascular disease."[1]

The AAT case involved a very thorough scrutiny by judicial officers of evidence in relation to wind farm noise and health impacts. It heard from multiple expert witnesses, considered published reviews (including that by the NHMRC in 2015) and heard from people affected by wind farm and other industrial noise in rural/regional localities. Its explicit findings invalidate the noise assessment methodology in DPE's *Wind Energy Noise Assessment Bulletin 2016* and the observations in that Bulletin about health impacts.

Since the developer used an assessment methodology similar to that in DPE's *Wind Energy Noise Assessment Bulletin* its methodology is also invalidated by the AAT findings.

The IPC cannot rely on any assertions from either the developer or the Department that the wind farm noise emissions will not cause material harm to the amenity or health of residents. For the same reason, the IPC cannot validly employ consent conditions proposed by the Department and the EPA based on existing policies. The AAT findings show those conditions will not ensure that harm to the amenity and health of residents is kept to an acceptable level.

Noise objections

Figure 7 of the Department's assessment report shows that:

- more than 25 submissions objected about noise and
- about 18 objected about health impact.

The IPC has a statutory obligation to consider all of those concerns submitted to it. In the light of the AAT findings, which post-date the Department's *Noise Assessment Bulletin*, the IPC is obliged to consider those objections in the light of the AAT findings.

DPE Assessment Report re noise

In its assessment report to the IPC, DPE refers to its Wind Energy Framework, issued in December 2016. The Department notes that the framework does not formally apply to the

[1] *Waubra Foundation v Commissioner of Australian Charities and Not-for-profits Commission* [2017] AAT, [476]

Bango proposal, since that proposal was initiated before issue of the framework. However, the report goes on to say:

> "Nonetheless, the Framework provides relevant guidance to decision-makers about the NSW Government's current policy position for assessing key impacts of wind energy developments, including in regard to visual and noise impacts on local communities." [2]

So the Department is claiming the IPC should accept the noise assessment guidelines published as part of the framework in 2016. The Department makes that statement despite having been advised[3] in December 2017 of the findings of the Federal AAT and despite the AAT process underlying those findings being far more rigorous than anything undertaken by the Department – and despite the Department not having warned the IPC that the AAT findings call into question the Department's noise guidelines; and not having offered the IPC any evidence to support its guidelines in light of the AAT findings.

The Department also states:

> "Both the EPA and the Department have undertaken a detailed assessment of the predicted noise impacts of the project, in accordance with applicable guidelines and policies. This assessment found that the project would be able to meet applicable noise criteria (with the implementation of noise management or sector management mode on specific turbines), and the Department has recommended strict noise limits provided by the EPA to protect the amenity of nearby residents (see Section 5.2)." [4]

The Department's statement that the wind farm "would be able to meet applicable noise criteria" may be correct. Unfortunately for the Department, ***the AAT findings cast doubt on the validity of those noise criteria and the measurement and calculation processes upon which they depend***.

The Department's report also states:

> "The EPA has indicated that it is satisfied that both the noise criteria and the predicted noise levels have been correctly calculated for the project, and that it would be able to issue an EPL for the project subject to the recommended noise limits." [5]

There is no evidence in the Department's report that the EPA has taken into account the findings of the AAT. If it has not done so, then the EPA recommendations are also invalid.

The Department's report also says:

> "BWF commissioned 3 noise impact assessments throughout the assessment period, including:
>
> • Bango Wind Farm Environmental Noise Assessment, Sonus, May 2016;
>
> • Bango Wind Farm and Rye Park Wind Farm Cumulative Environmental Noise Assessment, Sonus, April 2016; and

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[2] *State Significant Development Assessment Bango Wind Farm (SSD 6686)*, Department of Planning & Environment, February 2018, p. 12.

[3] Letter to Deputy Secretary Marcus Ray from Dr Michael Crawford, 11th December 2017.

[4] *State Significant Development Assessment Bango Wind Farm (SSD 6686)*, Department of Planning & Environment, February 2018, p. 20.

[5] *Ibid*, p. 41.

> • Bango Wind Farm Supplementary Environmental Noise Assessment, Sonus, May 2017.
>
> These assessments were all prepared in accordance with the applicable guidelines, including South Australia's *Environmental Noise Guidelines: Wind Farms (2003)* (SA Guidelines), which provides the accepted methodology for assessing wind farm noise in NSW." [6]

Thus DPE concedes that noise assessment by the proponent and the Department were all done using methods now invalidated by the AAT findings and that the EPA has offered advice apparently on that same invalidated basis.

The NSW Auditor General's report on *Assessing Major Development Applications*[7] emphasised that the, then, PAC was the only decision-maker for projects referred to it and that, while DPE provides assessments and information to the Commission, the latter had to be scrupulous to ensure that it alone was the decision-maker and seen to be the sole decision-maker and the sole determinant of the merits of the case.

If parties have offered important advice using methodologies for which the IPC has been given strong grounds to question the validity of those methodologies, then the IPC cannot accept that advice without first reviewing whether the underlying methodologies are valid in the light of the new information provided to it.

Potential noise impact is accepted by the Government and past PAC panels as a critical consideration in deciding on wind farm proposals. The AAT findings show the current methodology for assessing and monitoring wind farm noise is invalid in multiple ways. Were the IPC to approve the proposal without requiring review of the noise assessment process used, it would be likely approving asbestos in a building despite having received evidence that the standards and measurement underlying related government policy were materially flawed.

Obviously evidence invalidating NSW Government guidelines about wind farm noise also implies that past PAC decisions were made based on policies which are now shown to be defective. Those decisions were presumably made in good faith on the basis of evidence available at the time to the panels involved. Nonetheless, that is not a valid reason to persist with adherence to an approach once evidence has emerged to indicate the approach is seriously defective. Continuing to accept assessments using those defective methods, without ensuring proper review of them, taking account of the new evidence, would be procedurally unfair to potentially affected landowners.

The Administrative Appeals Tribunal process

It is important to appreciate the process of the Administrative Appeals Tribunal in the relevant matter, since it involved a rigour and impartiality beyond that applied to the production of the Department's noise guidelines.

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[6] *Ibid*, p. 41.

[7] *Assessing major development applications: Planning Assessment Commission*, Report by the NSW Auditor-General, 19 January 2017.

The Tribunal heard a case[8] relating to tax rights but most of the argument about those rights was focused on the possible health effects of noise emissions from wind farms. The Tribunal consisted of a senior Federal Court judge, The Honourable Justice White, presiding as President of the Tribunal, together with another Deputy President (K Bean). Evidence was taken over twelve days. Both parties to the case provided expert witnesses, with eight such witnesses testifying about noise and possible health effects. Those witnesses included acousticians and medical experts. The Tribunal also heard from people affected by wind farm and other industrial noise in rural/regional localities. Both of the parties to the case were represented by counsel, who subjected the expert witnesses to close questioning in order to ensure all the arguments put to the Tribunal were thoroughly tested. In addition, the Tribunal considered an extensive range of scientific publications on the matter, including (but not restricted to) the Systematic Review commissioned by the NHMRC and subsequent papers released by the NHMRC in 2015; a systematic review undertaken in Denmark; and the Health Canada study.

That process involved a degree of rigour absent from the manner in which DPE formulated its wind farm noise guidelines and indeed a level of rigour which IPC processes are unlikely to match, given their resources. It would therefore be a failure of due process were the IPC to make any decision involving the possible adverse noise and health impacts of the proposed Bango wind farm without the IPC paying very close attention to the AAT findings and the evidence and reasoning behind those findings.

The Administrative Appeal Tribunal findings

The Federal Administrative Appeals Tribunal made multiple findings in the case[9], where the findings have major implications for the assessment of wind farm impact on communities. The relevant findings were predominantly in relation to health impacts, wind farm noise and its assessment. However, there were also references to the visual impact of wind farms and its potential for health impacts.

Noise

The Tribunal[10] found that:

- It is established that some wind farms create noise *annoyance* for members of the community and that there is a well established pathway from *annoyance* to adverse health effects.
- *Annoyance* from wind farm emissions is common in Australia ***and*** overseas.
- A significant proportion of wind farm noise is in the low frequency range.
- Humans are more sensitive to low frequency sound, and it can therefore cause greater *annoyance* than higher frequency sound.
- Even if it is not audible, low frequency noise and infrasound may have other effects on the human body, which are not mediated by hearing but also not fully understood.

[8] *Waubra Foundation v Commissioner of Australian Charities and Not-for-profits Commission* [2017] AAT.
[9] *Ibid*.
[10] *Ibid*.

- Noise measurement using dB(A) is an ***inadequate*** measure of relevant wind farm noise; and wind farm noise measurement should not average noise over time and frequencies.
- Wind farm low frequency noise can be greater indoors than outdoors at a dwelling.
- There is as yet no properly established "dose-response" curve which applies to wind farm noise which can be used by policy makers to set appropriate limits on wind farm sound emissions. Consequently, limits have been set by reference to the levels which have been found to be applicable in the context of different kinds of noise, such as road traffic noise despite it being known that "dose-response" characteristics vary by noise source and that wind farm noise has significant differences from other noise sources.

These findings fundamentally invalidate the NSW wind farm noise guidelines and the standards and processes which the Department of Planning & Environment (DPE) has used to assess wind farm noise and approve wind farms, as well as the processes the NSW EPA uses to assess wind farm noise compliance.

The findings identify a specific pathway to adverse health effects via noise annoyance and that annoyance occurs in relation to many wind farms both in Australia and overseas.

It does not follow that *annoyance* will occur for every resident in the vicinity of a wind farm. However, the onus is on regulatory agencies to ensure that, for each wind farm, material harm from noise (and other factors) will not occur. The NSW wind farm noise guidelines inherently accept that responsibility. The Tribunal's findings indicate the NSW guidelines are defective and not fit for purpose.

The NSW wind farm noise guidelines have multiple important elements which the Tribunal findings invalidate:

- Sound measurement and standards are stated in terms of dB(A);
- Sound measurement is an average value over some period (10 minutes), and then effectively averaged over multiple periods;
- Sound measurement is done external to dwellings;
- For wind farm assessment, sound values are calculated;
- For most properties, wind farm compliance noise results are calculated rather than actually measured;
- "Acceptable" levels have been set based not on dose-response data for wind farms but on dose-response data for quite different noise sources (e.g. traffic noise) – which were developed with noise measures inappropriate for wind farms.

From the Tribunal's findings, each and every one of those is a source of invalidity. Collectively they render the NSW wind farm noise guidelines wholly invalid.

Wind farm noise and adverse health effects

The Tribunal repeatedly stated that it recognised humans are frequently subject to an identifiable experience ("*annoyance*") attributable to wind farm noise **and** that *annoyance* is an established pathway to significant adverse health outcomes. The Tribunal stated:

> "As our earlier findings have indicated, some wind farms generate sound which is capable of causing, and does cause, annoyance. We are further satisfied that annoyance of the kind which is generated (often associated with psychological distress and sleep disturbance), is a recognised pathway to a range of adverse health outcomes, including hypertension and cardiovascular disease."[11]
>
> "We accept that the evidence points to an association and a plausible pathway between WTN [wind turbine noise] and adverse health effects (of a physical nature), mediated by annoyance, sleep disturbance and/or psychological distress."[12]

and the experience of annoyance from WTN is widespread:

> "There are numerous examples of WTN giving rise to complaints of annoyance from nearby residents, both in Australia and overseas."[13]

Thus the Tribunal left no doubt that there are reasonable grounds for apprehension about an adverse effect of wind farm noise on health from each wind farm. The question in each instance is the extent of noise actually experienced by each resident and the adequacy of wind farm noise forecasting, measurement and control by regulatory authorities.

Wind farm noise: character and measurement

Based on the testimony of multiple expert witnesses, and published studies, the Tribunal made a number of important findings about the character and measurement of WTN. These findings have significant implications for wind farm noise standards and the appropriate measurement of wind farm noise. In particular, the Tribunal found[14]

- "A significant proportion of the sound emitted by wind turbines is in the lower frequency range, i.e. below 20 Hz;
- The dB(A) weighting system is not designed to measure that sound, and is not an appropriate way of measuring it;
- The most accurate way of determining the level and type of sound present at a particular location is to measure the sound at that location;
- The best way of accurately measuring WTN at a particular location is through 'raw' unweighted measurements which are not averaged across time and are then subjected to detailed "narrow-band" analysis;
- When it is present, due to its particular characteristics, low frequency noise and infrasound can be greater indoors than outdoors at the same location, and can cause a building to vibrate, resulting in resonance;
- Humans are more sensitive to low frequency sound, and it can therefore cause greater annoyance than higher frequency sound;
- Even if it is not audible, low frequency noise and infrasound may have other effects on the human body, which are not mediated by hearing but also not fully understood. Those effects may include motion-sickness-like symptoms, vertigo, and tinnitus-like symptoms. However, the material before us does not include any study which has

[11] *Ibid*, [476]
[12] *Ibid*, [500]
[13] *Ibid*, [468]
[14] *Ibid*, [469]

explored a possible connection between such symptoms and wind turbine emissions in a particular population."

The Tribunal further commented:

> "A major limitation is that the conclusions of the [Health Canada] study were based on calculated, rather than actual, noise measurements (although some of the calculated noise levels were based on measurements). However, as we understand the evidence, the sound generated by wind turbines is so variable that actual measurements are to be preferred. We accept that measurements based on estimates or averages may not accurately reflect the sound which was present when the particular level of annoyance was experienced or recorded."[15]
>
> "Another significant drawback of the Health Canada study, as we understand it, is that the WTN was measured in dB(A) and dB(C). All of the evidence before us is to the effect that WTN cannot be accurately captured in dB(A), or even dB(C) (although dB(C) is preferable). The preponderance of the acoustic evidence is also to the effect that by far the best way of capturing the sound produced by wind farms is to take unweighted measurements, and then subject them to detailed analysis, including narrow band analysis, to determine the components of the sound which is present."[16]

So the Tribunal concluded that:

> ***dB(A) is an inappropriate measure*** [Note. It is central to NSW wind farm noise assessment]
>
> - Sound measurement and standards stated in terms of dB(A) values are inappropriate for WTN because a significant part of WTN is low frequency, which dB(A) drastically underweights, and low frequency noise is particularly significant because[17]:
>
>> "Humans are more sensitive to low frequency sound, and it can therefore cause greater annoyance than higher frequency sound"
>>
>> "Even if it is not audible, low frequency noise and infrasound may have other effects on the human body, which are not mediated by hearing"
>>
>> "When it is present, due to its particular characteristics, low frequency noise and infrasound can be greater indoors than outdoors at the same location, and can cause a building to vibrate, resulting in resonance"
>
> and
>
>> "there is also broad agreement between the acoustic experts that wind turbine emissions cannot be captured in dB(A), and that the best way of measuring these is through unweighted measurements, subjected to detailed analysis." [18]:
>>
>> "The best way of accurately measuring WTN at a particular location is through 'raw' unweighted measurements which are not averaged across time and are then subjected to detailed "narrow-band" analysis" [19]

[15] *Ibid*, [478]
[16] *Ibid*, [479]
[17] *Ibid*, [469]
[18] *Ibid*, [353]
[19] *Ibid*, [469]

Measurements should not be averaged over some period [Note. The NSW process does so]

- The Tribunal stated:

> "We accept that measurements based on estimates or averages may not accurately reflect the sound which was present when the particular level of annoyance was experienced or recorded."[20]

and

> "The best way of accurately measuring WTN at a particular location is through 'raw' unweighted measurements which are not averaged across time and are then subjected to detailed "narrow-band" analysis"[21]

For low frequencies, outdoor measurements may underestimate indoor noise [Note. The NSW process uses outdoor measurements]

- The Tribunal noted:

> "When it is present, due to its particular characteristics, low frequency noise and infrasound can be greater indoors than outdoors at the same location, and can cause a building to vibrate, resulting in resonance"[22]

Inaccuracy in computed sound levels [Note. The NSW process uses measurement at a few locations and calculations for most]

- In developing wind farm proposals, (dB(A)) noise levels at all residences are computed based on a range of assumptions. Those predictions are then compared with calculated estimates of background noise levels (in dB(A)) at various wind speeds, extrapolated from measurements at a small number of locations in order to estimate increases in noise levels. In other words, the assessment is made by comparing one estimate with another, both of which are inherently subject to error. During compliance testing, noise levels at most residences are computed from measurement at a small number of locations. [Note. These are normally dB(A) values, in terms of 10 minute blocs, i.e. with the associated validity problems previously noted.] Pertinent to that, the Tribunal stated:

> "The most accurate way of determining the level and type of sound present at a particular location is to measure the sound at that location"[23]
>
> "A major limitation is that the conclusions of the [Health Canada] study were based on calculated, rather than actual, noise measurements (although some of the calculated noise levels were based on measurements). However, as we understand the evidence, the sound generated by wind turbines is so variable that actual measurements are to be preferred."[24]

In its summary of the scientific evidence, the Tribunal noted a number of factors that would underlie the inaccuracy of computed noise levels[25]:

> "WTN is complex, highly variable and has unique characteristics;"

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[20] *Ibid*, [478]
[21] *Ibid*, [469]
[22] *Ibid*, [469]
[23] *Ibid*, [469]
[24] *Ibid*, [478]
[25] *Ibid*, [468]

> "The amount and type of sound emitted by a wind farm at a given time and in a given location is influenced by many variables including topography, temperature, wind speed, the type of wind turbines, the extent to which they are maintained, the number of turbines, and their mode of operation;"

It is patently obvious that no computer model can accurately account for all of those variables and their combinations as will occur over days, weeks and years, and thus the exposure which individuals will experience, since none can forecast local weather on a day by day, hour by hour, basis for years.

Unsubstantiated limits set for wind farm noise [Note, as used in NSW]

- The Tribunal stated[26]:

> "Given the absence of detailed studies, we accept the evidence of many of the experts that there is as yet no "dose-response" curve which applies to wind turbine sound which can be used by policy makers to set appropriate limits on wind farm sound emissions. Consequently, limits are set by reference to the levels which have been found to be applicable in the context of different kinds of noise, such as road traffic noise. In many cases, the limits are set by reference to dB(A). We note again the consensus that wind farm sound emissions cannot be accurately captured in dB(A)."

In relation to that point, the Tribunal quoted the evidence of one of the experts, Mr Cooper[27]:

> "So we can have a dose-response curve for aircraft that sets a noise level that will protect 90 per cent of the people 90 per cent of the time. We have a dose-response curve for road traffic, which is a different number to aircraft, still to protect 90 per cent of the people 90 per cent of the time. We have a similar curve for rail traffic, again a different number, and so you have different dose-response curves. Work done by Moller in Germany in relation to two surveys that were done in Sweden showed that the dose-response curve for wind farms occurs at a much lower level. So if you use a dose-response curve for general community or road traffic noise, it's not the same as using it – you can't use that dose-response curve for wind farms until such time as you develop a proper dose-response curve."

Summary re noise

In its findings, the Tribunal was explicit that wind farm noise can cause annoyance to humans and does so in many cases. It also found that there is an established pathway from annoyance to significant adverse health outcomes. Consequently the proper evaluation of prospective and actual wind farm noise by regulatory authorities is critical.

The Tribunal identified multiple aspects of wind farm noise and its determination which invalidate the whole structure and approach of the NSW Planning Department and the NSW EPA in assessing noise from proposed and operating wind farms.

[26] *Ibid*, [480]
[27] *Ibid*, [451]

DPE assertions about health impact

DPE made a number of assertions about health in relation to the Bango wind farm:

> "In 2015, the NHMRC concluded that "*there is no direct evidence that exposure to wind farm noise affects physical or mental health*". More specifically, it stated that, "*while exposure to environmental noise is associated with health effects, these effects occur at much higher levels of noise than are likely to be perceived by people living in close proximity to wind farms in Australia*". The statement also suggested that further health based studies should concentrate on exposure in close proximity to wind farms (i.e. less than 1.5 km).
>
> The Department notes that BWF does not propose to construct any turbines closer than 1.8 km from nonassociated residences, and that the noise assessment found the project would not generate excessive levels of low frequency noise or infrasound. Consequently, the Department considers the health risks of the project to be negligible.
>
> Nonetheless, the Department will continue to monitor contemporary scientific research outcomes to ensure its position reflects robust evidence on any health effects, including any advice releases regarding potential health effects associated with low frequency noise or infrasound from the National Wind Farm Commissioner and the Independent Scientific Committee. (p. 44)" [28]

DPE claims "the Department considers the health risks of the project to be negligible". What actual expertise is there in the Department to assess health risks? It is not apparent that either of the signatories to DPE's assessment have relevant expertise or that, in relation to Bango and its emissions, they have gone through a process of comparable rigour to that of the AAT, using multiple expert witnesses questioned by the judicial members of the Tribunal and by counsel for the parties represented.

So what is the basis for DPE's claim about health risks being negligible in this case? It appears to be relying on several elements.

First a statement from the NMRC:

> "while exposure to environmental noise is associated with health effects, these effects occur at much higher levels of noise than are likely to be perceived by people living in close proximity to wind farms in Australia"

Note that statement says "environmental noise is associated with health effects" and then suggests something about the levels required for adverse health effects and exposure for people living in the vicinity of wind farms. However, the AAT findings are that the character of wind farm noise emissions are different from most other environmental noise sources and so conclusions based on those noise sources cannot be applied to noise from wind farms.

Note also that, even without that caveat, the NHMRC observed that "these effects occur at much higher levels of noise than are likely to be perceived by people living in close proximity to wind farms in Australia". Thus leaving aside the fact that the NHMRC appeared to be referring only to audible noise, the statement hinged on a belief about what sound levels would be experienced by people living in the vicinity of wind farms. But the NHMRC

[28] *State Significant Development Assessment Bango Wind Farm (SSD 6686)*, Department of Planning & Environment, February 2018, p. 44.

conducted no study or review of actual sound levels around wind farms, let alone relate that to the size and power of the turbines, both of which are increasing over time.

Related to that is the second point DPE appears to be relying upon. A distance of 1,500 metres appeared multiple times as some sort of threshold distance in the NHMRC documents, though NHMRC provided absolutely no actual research or other evidence to support the significance of that distance. DPE notes that BWF intends not to construct turbines any closer than 1.8 kms and so, if the 1,500 metres had any validity, it might be justification for the DPE claim.

So from where did the 1,500 threshold come? The NHMRC Information Paper upon which the NHMRC based the press release quoted by DPE said:

> "Background evidence indicates that wind farm noise is generally in the range of 30–45 A-weighted decibels (dBA) at a distance of 500–1,500 m from a wind farm and below 30–35 dBA beyond 1,500 m. Although individuals may perceive aspects of wind farm noise at greater distances, it is unlikely that it will be disturbing at distances of more than 1,500 m." [29]

Examples in the section "Real world experiences of residents" (below) show the claim of not being disturbed at distances beyond 1,500 m is woefully wrong. Further, the claim depends on the assertion that noise measured in dB(A) will not be disturbing at 1,500 m. Yet one of the important AAT findings is that dB(A) is fundamentally the wrong measure of noise for wind farms since it does not adequately capture the amount of lower frequency noise and, in any case, simple sound volume levels ignore the complexity of disturbing effects such as discrete frequencies and amplitude modulation occurring at different frequencies. The NHMRC did not deal with any of that peculiar character in the nature of wind farm noise.

In addition, the NHMRC commissioned a number of external reviewers to comment on the material it was compiling. Some of them took issue with the 1,500 m assertion, for which the NHMRC had provided no evidence. Emeritus Professor Colin H Hansen stated:

> "The fourth dot point which states, "*It is unlikely that substantial wind farm noise would be heard at distances of more than 500–1500 m from wind farms*" is incorrect. I have many measurements showing that wind farm noise can be heard at distances up to 8 km from a wind farm." [30]

The third point DPE appears to be relying upon is its claim "the noise assessment found the project would not generate excessive levels of low frequency noise or infrasound."

How does DPE know what is an "excessive level" of low frequency noise or infrasound? The NHMRC, upon which DPE claims to be relying, said there is insufficient knowledge about those effects. Further, the AAT found that it is not simply levels of low frequency noise and infrasound that appear to matter, but discrete frequencies and other characteristics of the noise, both audible and inaudible frequencies. Thus DPE has no empirical basis for its claim.

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[29] *Information Paper: Evidence on Wind Farms and Human Health*, NHMRC, February 2015, (*Information Paper*) p. 2.

[30] Colin H Hansen, *Expert Review of the NHMRC Draft Information Paper, "Evidence on Wind farms and Human Health"*, April 10, 2014.

DPE has made some assertions about health risk being negligible which rely only on ignoring the AAT findings and on taking some NHMRC statements out of context and without understanding the limitations of those statements.

It might be noted that where DPE has chosen to rely on its particular interpretation of the NHMRC statements, the AAT consider the NHMRC publications as well as other scientific publications, plus heard and tested evidence from medical and acoustic experts and concluded that wind farm does cause annoyance to residents and that annoyance is a pathway to serious adverse health outcomes.

Real world experiences of residents

The IPC and DPE can gain knowledge of the real world experiences of people exposed to wind farms by talking to them, or even reading their submissions to DPE and the IPC. For instance, submissions have been recently published about proposed modifications to Stage 2 of the White Rock wind farm (Stage 1 is already in operation). People living in the vicinity have lodged the following comments:

> "*my wife and family live app 3kilometres east from the existing white rock wind farm now in operation. we are now enduring periods of noise at night that make it very difficult to sleep. We were told very little noise would be produced but that is not the case,* (*emphasis added*) we saw soil erosion and land slip happen during construction of stage 1.The topography of the proposed stage 2,is very steep and as they are wishing to increase the clearance of vegetation there is the real danger or serious erosion, land slips and the potential of contaminate our pristine permanent creek which one of very few that can carry trout. We therefore object to the modification 6 on these grounds plus the increase in visual pollution, light pollution and noise levels. This area is highly productive agricultural land with high rainfall and excellent soils not industrial land. Thank you for your time." (**Submission 248549**)
>
> "We purchased our property two (2) years ago. At the time we were told that there would be no wind farms near our place or home. *We now find that stage 1 of the wind farm is 5 kilometers away and we hear the noise at night and in the early morning*. (*emphasis added*)
>
> Now, totally unknown to us until Monday 5 March 2018 when White Rock Wind Farm representatives visited us, we now find that stage 2 of the wind farm is proposed to go ahead with an additional 48 turbines. Of these, 3 turbines will only be 2 kilometers away from our home and by White Rock's people will expose us to considerable noise and they will be visible - being an ugly sight on our beautiful landscape.
>
> We have also been told by the real estate agents in Glen Innes that our land value will drop considerably due to the closeness of the turbines. We are also concerned because we are one family of only two who live permanently in the location.
>
> We are not against wind farms but these 3 proposed turbines are too close to our home and will destroy our quality of life. We ask that these 3 turbines be moved further away from us." (**Submission 249005**)

So, in the brief period the White Rock wind farm modification was open, two families lodged objections based on the adverse impact on them of noise from Stage 1 of that wind farm. One family is 3 kms from the wind farm, the other 5 kms. That wind farm was approved with the usual claims of being able to comply with the guidelines. Perhaps it does. In any case,

families are nonetheless being subject to annoyance due to noise they experience from that wind farm.

It is quite clear from these examples that the 1,500m distance which DPE purports to rely upon is wrong and that annoyance with its potential adverse health outcomes is being experienced at least 3 times that distance from NSW wind farms which DPE has recommended for approval.

For further examples of real world impact, the IPC could consider testimony given by many wind farm affected people to the Senate Select Committee on Wind Turbines, which reported in August 2015.

It should be noted that the existing White Rock wind farm whose noise is distressing these people has 2.5MW turbines, tip height 150m and rotor diameter 121m [31]. Bango wind farm is proposing 3.4MW turbines, with tip height 200m and rotor diameter 145m.

So the turbines proposed for Bango wind farm are substantially larger and more powerful than the ones at the White Rock wind farm that are causing distress to families 3kms and 5kms from that wind farm. One can reasonably expect adverse noise effects at distances from the Bango wind farm no less than those reported for White Rock wind farm and likely greater.

Visual impact, annoyance and adverse health outcomes

The AAT decision includes a number of references to annoyance being caused or exacerbated by the visual impact of wind farms (including general visual appearance, shadow flicker and blinking lights). In that regard the Tribunal's report cited a literature review by Danish researchers[32], the Health Canada study[33], and the evidence of expert witnesses Professor Wittert[34] and Dr McBride[35].

On this matter, Professor Wittert, giving evidence on behalf of the Australian Charities and Not-for-profits Commission, stated[36]:

- "The respondents' attitude to the visual impact of wind turbines on the landscape scenery has been found to influence noise annoyance in a number of studies."
- "In peer reviewed studies, wind turbine annoyance has been statistically associated with wind turbine noise, but found to be more strongly related to visual impact, attitude to wind turbines and sensitivity to noise."
- "That aside, annoyance appears to be more strongly related to visual cues and attitude than to noise itself."

With the benefit of all the evidence, the Tribunal concluded[37]:

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[31] White Rock wind farm seeks a modification for Stage 2 to go to 200m tip height, 170 m diameter and turbine power 3MW-3.4MW.

[32] *Waubra Foundation v Commissioner of Australian Charities and Not-for-profits Commission* [2017] AAT, [268]

[33] *Ibid*, [273]

[34] *Ibid*, [363]

[35] *Ibid*, [374]

[36] *Ibid*, [363]

[37] *Ibid*, [483]

> "We have not overlooked the evidence to the effect that, while annoyance is produced by wind farms, it may have no association with wind turbine sound emissions and instead be related to other things, such as loss of amenity, the appearance of the turbines and consequent change to the landscape, blinking lights, or other factors. Whether that is so is yet to be established, one way or the other."

Thus the Tribunal accepted the possibility that visual impact, in its various forms, may be a contributor to *annoyance* and thus, via the *annoyance* pathway, to adverse health impacts.

DPE, in its guidelines for the assessment of visual impact and in its visual impact assessments of wind farms, does not appear to have contemplated that this form of impact is also a potential mechanism contributing to *annoyance* and thus leading to adverse health outcomes.

While there is a scientific interest in the mechanisms by which wind farms lead to *annoyance*, and there may be a regulatory one in terms of control, from the point of view of members of affected communities, the precise mechanism by which wind farms cause *annoyance* and potential harm to their health is moot. What matters to them is the outcome. That should also be true for any consent authority deciding on wind farm proposals. If a wind farm will cause material levels of annoyance to residents, affecting their amenity of life and their health, then irrespective of the mechanism inducing the annoyance, the consent authority is obliged to take that into account in making a merit decision.

In his evidence to the Tribunal, Professor Wittert stated[38]:

> "Epidemiological studies have shown associations between living near wind turbines and annoyance"

For those impacted, that statement is really the bottom line, together with the consequences of the *annoyance* on their health.

It is also the responsibility of consent authorities to consider the overall magnitude of impact on people in determining wind farm applications, not precisely how much comes from noise, or visual impact or some other mechanism discretely.

If there is a compounding effect in the creation and level of *annoyance*, as is suggested by some of the evidence given to the Tribunal, then it is certainly wholly inappropriate to consider each factor that might engender *annoyance* for a resident, decide that the *annoyance* due to each factor on its own is below some assumed critical threshold and then proceed to ignore the effect from each factor both individually and collectively.

Implications for credibility of NSW Government's advisers on noise

The AAT findings discredit not just the NSW Government's wind farm noise guidelines but necessarily any long-term advisers to the NSW Government who were instrumental in formulating those guidelines. Since the AAT, after taking extensive evidence, has found practices such as those used by the NSW Government are defective in many ways, it follows that whoever advised the NSW Government to adopt those guidelines has given bad advice.

[38] *Ibid*, [363]

Since it appears those advisors have been giving that same bad advice over many years, recognition that they have been doing so would threaten their professional standing. Consequently, they cannot reasonably be expected to objectively consider the AAT findings which challenge their own entrenched views and careers.

Thus the IPC cannot fairly rely on noise advice from NSW Government advisors who have a history of supporting wind farm noise practices which the AAT has found to be invalid – or indeed any other acousticians or medical professionals who have a well established position that existing wind farm noise policies are appropriate or that wind farms do not cause any harmful health outcomes.

Conclusions

The Tribunal stated directly:

> "some wind farms generate sound which is capable of causing, ***and does cause*** (*emphasis added*), annoyance. We are further satisfied that annoyance of the kind which is generated (often associated with psychological distress and sleep disturbance), is a recognised pathway to a range of adverse health outcomes, including hypertension and cardiovascular disease."[39]
>
> "We accept that the evidence points to an association and a plausible pathway between WTN and adverse health effects (of a physical nature), mediated by annoyance, sleep disturbance and/or psychological distress."[40]

The AAT thus repudiated the benign statement of health impacts presented in DPE's *Wind Energy Noise Assessment Bulletin 2016.*

The Tribunal also identified multiple factors associated with wind farm noise and its measurement which invalidate DPE's wind farm guidelines in terms of both methodology and standards.

The Tribunal found that wind farm noise measurement practices, such as those of the NSW Government, measure the wrong thing (using dB(A)), use inappropriate averages, measure it at the wrong place (external rather than internal), rely on inevitably inaccurate calculations rather than actual measurement, and set standards for acceptability based on "dose-response" curves for the wrong type of noise source. In short, virtually every aspect of the methodology and standards is defective.

DPE has been assessing wind farms and recommending approval of wind farms for many years. It has apparently made no effort to have dose-response curves empirically developed for wind farm noise despite acousticians long knowing that dose-response curves vary based on the type of noise.

The Tribunal also discussed evidence and grounds for accepting that the visual impact of wind farms may contribute to *annoyance* experienced by residents and thus to adverse health outcomes – something DPE has not attempted to incorporate into its wind farm guidelines.

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[39] *Ibid*, [476]
[40] *Ibid*, [500]

The Tribunal's findings are a new, authoritative statement by a legal body, led by a senior Federal Court Justice, which very carefully considered a wide range of evidence from multiple sources.

There is a reasonable presumption that the range of evidence considered, the rigour of process, and the judicial expertise in weighing evidence exceeds that which DPE and the PAC/IPC have been able to bring to previous wind farm assessments, to the prospective Bango wind farm assessment, or the preparation of wind farm guidelines.

It follows that, in relation to the Bango proposal, the IPC cannot rely on noise assessments provided by the developer or any made by DPE using its own guidelines. Nor is the IPC able to accept any consent conditions proposed by DPE or EPA, based on those guidelines, as adequately protecting amenity for the community or protecting it from harm.

Under those circumstances, any decision by the IPC deeming noise from Bango wind farm to be "acceptable" or deeming noise consent conditions based on current guidelines to be adequate to protect the community would be a willful disregard of evidence, procedurally unfair and indicate bias.

Due process requires the IPC to reject the proposal until the relevant guidelines have been independently reviewed and altered as appropriate given the AAT findings, and the noise (and other factors which may affect annoyance) for Bango reassessed on that basis.

NSW GOVERNMENT | Planning & Environment

Government Information (Public Access) Act 2009

NOTICE OF DECISION – INTERNAL REVIEW

Applicant:	**Dr Michael Crawford**
File Ref:	**GIPAA – 2016/17-091 - IR**
Decision maker:	**Cameron Davies, A/g Manager Privacy and Information Access**
Date of decision:	**20 July 2017**

Table of contents

1. Summary of access application

On 21 April 2017, the Department of Planning and Environment (the Department) received your access application under the *Government Information (Public Access) Act 2009* (GIPA Act). You asked for access to information relating to advice provided on visual impact of wind farm developments that had been approved by the Planning Assessment Commission. You also asked for information relating to advice used by the Department when creating the *Wind Energy Visual Assessment Bulletin 2016*.

Your original request is reproduced verbatim at Attachment A to this report.

On 21 May 2017 the Department decided your application by refusing to provide access to the information because there was an overriding public interest against disclosure of the information.

On 19 June 2017 you requested an internal review of the decision to refuse to provide access to the information requested. You also raised the issue of how the Department had interpreted the scope of your application.

On 6 July 2017 the decision date for the internal review was extended to 21 July 2017 by agreement under section 57 of the GIPA Act. There was also discussion about rescoping the application.

On 10 July 2017 the scope of the application was amended to be:

1. *Please provide access to records that contain the names of individuals who provided specialist visual impact advice to the Department of Planning and Environment (DPE) in relation to the recommendations to the Planning Assessment Commission (PAC) for the following wind farm developments:*
    - *Biala*
    - *Crudine Ridge*
    - *Rye Park*
    - *Yass Valley*
2. *Please provide access to records that contain the names of individuals who provided to the DPE specialist visual impact advice that was used in development of the Department's Wind Energy Visual Assessment Bulletin 2016.*
3. *For each person identified in points 1 and 2 above, and for individuals who signed a DPE recommendation to the PAC for the four wind farm developments listed above, please provide access to any records held by DPE that show that the individual:*
    - *has undertaken any formal courses in order to learn how to accurately assess the visual impact specifically of wind farms or similar infrastructure;*
    - *has been tested for their ability to make accurate assessments of the visual impact of wind farms or similar infrastructure, and their score on those tests;*
    - *has been tested for the degree to which their assessments of the visual impact of wind farms or similar infrastructure are consistent with the visual impact judgements made by residents to the impact and their consistency scores.*

Note: The request for information at points 1 and 2 excludes the names of consultants working on behalf of wind farm proponents and members of the general public.

Note: Reference to 'wind farms or similar structure' means 'wind farms or other infrastructure of similar scale in rural areas'.

Note: The request is only for details of courses or testing dealing specifically with visual impact of wind farms or infrastructure of similar scale, not any other qualifications.

2. Conduct of internal review

This is an internal review. It has been conducted in accordance with section 84 of the GIPA Act. The decision in this internal review has been made as if the original decision had not been made and it has been made as if it were being made when the access application to which the review related was originally received.

I confirm that I did not make the original decision which is being reviewed and that I am no less senior than the person who made the original decision.

3. Decision

I am authorised by the principal officer, for the purposes of section 9(3) of the GIPA Act, to decide your access application.

I have decided;

- under section 58(1)(a) of the GIPA Act, to provide access to some of the information you requested;
- under section 58(1)(b) of the GIPA Act that the Department does not hold some of the information you requested; and
- under section 58(1)(c) of the GIPA Act that some of the information you requested is already available to you.

To meet the requirements of section 61 of the GIPA Act, I need to tell you:

a) the reasons for my decision and the findings on any important questions of fact underlying those reasons; and
b) the general nature and format of the records containing the information you asked for, with reference to the relevant public interest considerations against disclosure.

You can ask for a review of this decision. For details about how to do so, see part 8 of this Notice.

4. Searches for information

Under the GIPA Act, the Department must conduct reasonable searches for the government information you asked for in your application. The Resource Assessment and Industry and Infrastructure Policy sections searched our records and identified the information the Department holds that falls within the scope of your application.

5. The public interest test

Under section 9(1) of the GIPA Act, you have a legally enforceable right to access the information you asked for, unless there is an overriding public interest against its disclosure.

Further, under section 5 of the GIPA Act, there is a presumption in favour of disclosing government information unless there is an overriding public interest against its disclosure.

To decide whether or not there is an overriding public interest against disclosure of the information you asked for, I applied the public interest test, which is set out in section 13 of the GIPA Act.

I applied the public interest test by:

(a) identifying any public interest considerations in favour of disclosure;

(b) identifying any relevant public interest considerations against disclosure; and

(c) deciding where the balance between them lies.

I did this in the way required by section 15 of the GIPA Act, which is:

(a) in a way that promotes the objects of the GIPA Act;

(b) with regard to any relevant guidelines issued by the Information Commissioner;

(c) without taking into account the fact that disclosure of information may cause embarrassment to, or a loss of confidence in, the Government (as that fact is irrelevant);

(d) without taking into account the fact that disclosure of information might be misinterpreted or misunderstood by any person (as that fact is irrelevant); and

(e) with regard to the fact that disclosure cannot be made subject to any conditions on the use or disclosure of information.

4.1 Information already available

Under section 59 of the GIPA Act the Department can decide that information is already available to an applicant if the information is made publicly available by the agency or some other agency in accordance with a legislative instrument other than this Act, whether or not availability of the information is by inspection only and whether or not availability is subject to a charge.

The information relating to the people who provided specialist advice in relation to the four windfarms you listed in your application is already publicly available as part of the assessment process for the wind farms. The information is available on the Department's Major Projects Assessment website.

Access to this information is discussed in section 5 of this Notice.

4.2 Public interest considerations in favour of disclosure

Under section 12(1) of the GIPA Act, there is a general public interest in favour of disclosing government information. Section 12(2) of the GIPA Act sets out some examples of other public interest considerations in favour of disclosure. However, I am not limited to those considerations in deciding your application.

I find the following considerations in favour of disclosure are relevant to your application:

- Disclosure of the information could reasonably be expected to inform the public about the sources of information the Department relies on in relation to wind farms.

4.3 Public interest considerations against disclosure

When applying the public interest test, the only public interest considerations against disclosure that I can take into account are those set out in the table to section 14 of the GIPA Act. To show that they are relevant to the information you asked for, I need to consider whether they could reasonably be expected to have the effect outlined in the table.

I have identified the following considerations against disclosure as being relevant to your application:

- disclosing the information might reasonably be expected to prejudice any person's legitimate business, commercial, professional or financial interests (clause (4)(d))

I have considered whether and how disclosing the information might prejudice the business, commercial, professional or financial interests of the people who provided specialist advice that was used in development of the Department's *Wind Energy Visual Assessment Bulletin 2016*.

I find that the release of the information is unlikely to prejudice their interests because of the quality of their advice and the fact that their advice was a contribution to the Bulletin that was ultimately authored by the Department rather than the people who provided the advice.

In the case of information that is already publicly available I consider that there are no public interest considerations against disclosure that are relevant.

4.4 Consultation

The information that you asked for includes information that is professional information of other people. I was therefore required, under section 54 of the GIPA Act, to consult with those people before releasing the information.

There were no objections to the release of the information.

4.5 Balancing the public interest test

I have considered the relevant public interest considerations in favour of and against disclosure of the information you requested.

Having weighed up the considerations, I have decided that there is no overriding public interest against the disclosure of the information about advice provided in relation to the four wind farms nor advice provided that contributed to the Department's *Wind Energy Visual Assessment Bulletin 2016*. In making this decision I have taken into account the fact that some of the information is already publicly available and that some information contributed to a document that is publicly available.

4.6 Information not held

I have decided under section 58(1)(b) of the GIPA Act that the Department does not hold the information requested at point 3 of your amended application. I note that you have requested access to very specific information regarding education and training relating to visual impact assessment of wind farms and specifically excluded any other qualifications identified people have.

The Department holds information about the educational and professional qualifications and professional experience of the people identified that falls outside the scope of your application. It is possible that that information could be made available to you if you requested it. If you wish to access that information please see the information about the contact officer in section 9 of this Notice.

6. Form of access

Section 72 of the GIPA Act provides the ways in which information can be provided in response to a formal GIPA access application. This would ordinarily be done by providing a copy of the records or an opportunity to inspect the records.

However, under section 75 of the GIPA Act, an agency may provide access to information by creating a new record. Due to the relatively small amount of information you have requested and the varied locations and formats of that information, an agreement was reached whereby the information you requested will be provided by the Department creating a new record. That new record is attached to this Notice.

7. Processing charges

Under section 87 of the GIPA Act no processing charges can be imposed for conducting an internal review. There are no charges imposed in relation to this internal review.

8. Disclosure log

If information that would be of interest to other members of the public is released in response to a formal access application, an agency must record certain details about the application in its 'disclosure log' (under sections 25 and 26 of the GIPA Act).

You were also advised of your right to object to the inclusion of details about your access application in the disclosure log, in certain circumstances (for example, if you seek access to your own personal information). You did not object to details about your application being included in the disclosure log.

I have decided that the information would be of interest to other members of the public and will therefore record the following details in our disclosure log, which is publicly available on our website:

- the date on which your access application was decided (that is, the date of this notice of decision);
- a description of the information that will be released to you;
- whether that information is or will be available to other members of the public; and
- if so, how it can be accessed.

9. Review rights

If you disagree with any of the decisions in this notice that are reviewable, you may seek a review under Part 5 of the GIPA Act. Before you do so, I encourage you to contact me. My contact details are below.

You have two review options:

- external review by the Information Commissioner; or
- external review by the NSW Civil and Administrative Tribunal (NCAT).

You have 40 working days from the date of this Notice to apply for a review by the Information Commissioner or NCAT.

To assist you, I have enclosed a fact sheet published by the Information and Privacy Commission NSW (IPC), entitled Your review rights under the GIPA Act. You will also find some useful information and frequently asked questions on the IPC's website, www.ipc.nsw.gov.au.

You can also contact the IPC on freecall 1800 IPC NSW (1800 472 679).

10. Further information

If you have any questions about this notice or would like any further information, please contact Mr Cameron Davies, A/g Manager Privacy and Information Access, on (02) 8217 2088.

[redacted]

Cameron Davies
A/g Manager
Privacy & Information Access
Department of Planning and Environment

Attachment A – Original scope of application

The original scope of your application was as follows:

A. *Please provide the names of all individuals who provided visual impact advice:*

1. *which the signatories to DPE's recommendations to the PAC for each of the Biala, Crudine Ridge, Rye Park and Yass Valley wind farms relied upon in producing formal assessments of visual impact and in making those recommendations to the PAC and in giving any subsequent visual impact advice to the PAC.*

2. *to DPE (whether employed by DPE or a consultant) as an expert used by DPE in producing its Wind Energy Visual Assessment Bulletin 2016 (I will forward this component of the request to Alison Frame/Felicity Greenway).*

B. *For each person who signed a DPE assessment and recommendation to the PAC for Biala, Crudine Ridge, Rye Park or Yass Valley wind farms, and for each person identified under question A (above), please provide a copy of any records held by the Department which show that the individual:*

1. *has undertaken any formal courses in order to learn how to accurately assess the visual impact specifically of wind farms or similar infrastructure;*

2. *has been tested for their ability to make accurate assessments of the visual impact of wind farms or similar infrastructure, and their scores on those tests;*

3. *has been tested for the degree to which their assessments of the visual impact of wind farms or similar infrastructure are consistent with the visual impact judgements made by residents subject to the impact, and their consistency scores.*

Note. In the points above, reference to "wind farms or similar infrastructure" means "wind farms or other infrastructure of similar scale in rural areas". The request is only for details of courses or testing dealing specifically with VI of wind farms or infrastructure of similar scale, not any other qualifications.

DPE Personnel Signing Recommendation to PAC	
Wind Farm	***DPE Personnel***
Biala	*Mike Young, Nicole Brewer*
Crudine Ridge	*David Kitto, Mike Young*

Rye Park	*David Kitto, Mike Young*
Yass Valley	*David Kitto, Mike Young*

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Information provided

Names of people who provided specialist advice about the visual impact of windfarms:

- Biala wind farm – Andrew Homewood
- Crudine Ridge wind farm – Andrew Homewood
- Rye Park – Terry O'Hanlon
- Yass Valley – Richard Lamb

Names of people who provided advice that was used in the *Wind Energy Visual Assessment Bulletin 2016*: Terry O'Hanlon and Dennis Williamson.

Government Information (Public Access) Act 2009

NOTICE OF DECISION

Applicant:	**Dr Michael Crawford**
Agency:	**Planning Assessment Commission**
Decision maker:	**James Hebron – General Counsel, Department of Planning and Environment**
Date of decision:	**16 October 2017**

Table of Contents

1. Summary of access application

On 26 April 2017, the Planning Assessment Commission (PAC) received your access application under the *Government Information (Public Access) Act 2009* (GIPA Act). You asked for information about:

- the PAC members assigned to determine four wind farm applications; and
- individuals and organisations who provided advice that the PAC relied on when determining the four wind farms

The full scope of your original application is at **Attachment A**.

2. Original decision

On 24 May 2017, the PAC decided your application by deciding to refuse to provide access to information under section 58(1)(d) of the GIPA Act. The PAC decided that there was an overriding public interest against disclosure of the information.

3. Request for internal review

On 26 June 2017, you requested an internal review of the PAC's original decision. The PAC did not complete the internal review within the timeframe set out in section 86(1) of the GIPA Act. By agreement between yourself and the PAC the timeframe for completing the internal review was extended under section 86(4) of the GIPA Act.

4. Conduct of this internal review

This internal review has been conducted in compliance with section 84 of the GIPA Act. I have made my decision as if the original decision had not been made and with the internal review decision being made as if it were being made when the access application was originally made.

Some of the information that you seek access to relates to the principal officer of the PAC who would have otherwise decided the internal review. To avoid actual or perceived bias the internal review is being conducted by an independent third party, General Counsel of the Department of Planning and Environment under authorization by the principle officer of the PAC. You agreed to this arrangement in a telephone conversation with David Mooney of the PAC. A copy of the authorisation is at **Attachment B**.

5. Decision

In relation to parts A1, A2, A3 and B2 of your access application, I have decided under section 58(1)(b) of the GIPA Act, that the PAC does not hold the information you requested.

In relation to part B1 of your access application, I have decided under section 58(1)(c) of the GIPA Act that the information you have requested is already available to you.

In this Notice of Decision I will explain the reasons for my decision.

6. Searches for information

Under the GIPA Act, agencies must conduct reasonable searches for government information requested in an access application. A search of the PAC's records has been undertaken, to identify all government information falling within the scope of your application.

Specifically, the Human Resources section PAC's electronic document management system was searched. That section's files include folders relating to each Commissioner that contain information about their appointment and other relevant information. The electronic document management system was also searched by keyword/name to locate information relating to those individuals and organisations that provided advice the PAC relied on when making its decisions in relation to the wind farm.

7. Information not held

I have decided under section 58(1)(b) of the GIPA Act that the PAC does not hold the information requested at points A1, A2, A3 and B2 of your application.

The searches for information identified information about the Commissioners listed in your application including their curriculum vitaes and resumes which contain information about their educational and professional experience.

However, I note that you have requested access to information specifically regarding education and training relating to visual impact assessment of wind farms and specifically excluded any other qualifications the Commissioners hold. The information the PAC holds does not go into the level of detail you have requested.

To assist you in understanding the appointment process for Commissioners and the decision-making process they undertake I am providing you with additional information below.

The Commission members are appointed to the PAC by the Minister. One of the members is also appointed chair of the Commission. The chair of the Commission appoints members to a panel to carry out the Commission's functions.

When appointing Commission members, the Minister is to have regard to the need to have a range of expertise represented among the Commission's members. Each member is required to have expertise in at last one field of either planning, architecture, heritage, the environment, urban design, land economics, traffic and transport, law, engineering, tourism or government and public administration. This ensures that panels are constituted with a suitable range of skills and experience.

With regards to the tested ability to make accurate and reliable assessments of those who provided advice to the PAC about wind farms, the PAC does not engage those advisors to perform visual impact assessments of wind farms. The wind farm proponents, the Department of Planning and Environment or other stakeholders engage those advisors and provide assessments to the PAC.

8. Information already available

At point B1 of your request you asked for a list of all individuals or organisations upon whose advice about visual impact the PAC Commissioners relied in reaching their decision in relation to the four wind farms.

I have decided, under section 58(1)(c) of the GIPA Act, that this information is already available to you. All information the PAC took into consideration when deciding the four wind farms is available on the PAC's website. This includes the details of people and organisations that provided advice upon which the PAC relied when determining the wind farms. You can access this information free of charge at the following locations:

http://www.pac.nsw.gov.au/projects/2016/12/biala-wind-farm

http://www.pac.nsw.gov.au/projects/2016/01/crudine-ridge-wind-farm

http://www.pac.nsw.gov.au/projects/2017/03/rye-park-wind-farm

http://www.pac.nsw.gov.au/projects/2015/02/yass-valley-wind-farm-project

6 Disclosure log

If information that would be of interest to other members of the public is released in response to a formal access application, an agency must record certain details about the application in its 'disclosure log' (under sections 25 and 26 of the GIPA Act).

Given that the information the PAC holds is already publicly available I have decided not to include details of that information on the PAC's disclosure log.

7 Review rights

If you disagree with any of the decisions in this notice that are reviewable, you may seek a review under Part 5 of the GIPA Act. Before you do so, I encourage you to contact the PAC to discuss your concerns.

You have two review options:

- external review by the Information Commissioner; or
- external review by the NSW Civil and Administrative Tribunal (NCAT).

You have 40 working days from the date of this Notice to apply for a review by the Information Commissioner or NCAT.

To assist you, I have enclosed a fact sheet published by the Information and Privacy Commission NSW (IPC), entitled Your review rights under the GIPA Act. You will also find some useful information and frequently asked questions on the IPC's website: www.ipc.nsw.gov.au.

You can also contact the IPC on freecall 1800 IPC NSW (1800 472 679).

8 Further information

If you have any questions about this notice or would like any further information, please David McNamara on [redacted] or [redacted]

[redacted]

James Hebron
General Counsel
Department of Planning and Environment

Attachment A

Scope of original application

A. For each PAC member assigned to the PAC panel to determine approval for Biala, Crudine Ridge, Rye Park or Yass Valley wind farms, please provide a copy of any records held by the PAC which show that the individual:
    1. has undertaken any formal curses in order to learn how to accurately assess the visual impact specifically of ***wind farms or similar infrastructure***;
    2. has been tested for their ability to make accurate assessments of the visual impact of ***wind farms or similar infrastructure***, and their scores on those tests;
    3. has been tested for the degree to which their assessments of the visual impact of ***wind farms or similar infrastructure*** are consistent with the visual impact judgements made by residents subject to the impact, and their consistency scores.

Note reference to "***wind farms or similar infrastructure***" means "***wind farms or other infrastructure of similar scale in rural areas***". The request is only for details of courses or testing dealing specifically with visual impact of wind farms or infrastructure of similar scale, not any other qualifications.

B. For each of the four wind farms below:
    1. a list of all individuals or organisations upon whose advice about visual impact the PAC Commissioners relied in reaching their decision; and
    2. a copy of records the PAC holds demonstrating the tested ability of those advisors to make accurate and reliable assessments of ***wind farms or similar infrastructure*** consistent with visual impact judgements made by residents subject to the impact.

PAC Commissioners Making Determination

Wind Farm	**PAC Members**
Biala	Garry West, Prof Zada Lipman, Dr Maurice Evans
Crudine Ridge	Annabelle Pegrum, Andrew Hutton, Dr Maurice Evans
Rye Park	Gordon Kirkby, John Hann, Ross Carter
Yass Valley	Lynelle Briggs, Annabelle Pegrum, Robyn Kruk

Willful Failure to Comply with s7(1)(c) of Schedule 2 of the EP&A Regulation

Dr Michael Crawford

21st March 2018

The developer has willfully refused to provide mandatory information required under section 7(1)(c) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. It has refused to provide "an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure", as is required by the Regulation. In so doing, the developer has denied the consent authority information without which it cannot make a valid merit decision consistent with the Objects of the Act in favour of the project. The developer has also denied members of the affected community information required under the Regulation which would have allowed them to better understand the implications of the project and formulate their submissions to government. Further, by willfully failing to provide the analysis mandated by s7(1)(c), the developer appears to have breached section 10.6 of the Environmental Planning and Assessment Act 1979, which prohibits the provision of false or misleading information in relation to a planning matter.

Contents

Summary

Section 7(1)(c) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* makes the provision of certain information in an EIS mandatory. The Bango wind farm EIS does not include the information required. Nor is that information included in the subsequent Response to Submissions and Preferred Project Report.

Since the omitted information would potentially weaken or destroy the case for the project, and the Regulation says it ***must*** be provided, acceptance of its absence when assessing the project would be willful denial of due process to parties who may be adversely affected by the project.

Section 7(1)(c)

Section 7(1)(c) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, requires that the EIS ***must*** include:

> "an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure"

The revised SEARS issued by the Department in November 2015 restated this requirement from the Regulation and elaborated by noting it included the requirement for "an assessment of the environmental costs and benefits of the development *relative to alternatives (my emphasis)"*.

Note, the requirement is stated in terms of "*the development*", and "*to the carrying out of the development*" not in terms of various configurations of the development on that site.

Content of the EIS

The Bango EIS includes a section 4.6.6 "Consequence of not proceeding with the Project" which purports to respond to part of the s7(1)(c) requirement but which is in fact some bald and unsubstantiated assertions, with no analysis, and which will be shown to be misleading. Those claims assume no one would elsewhere develop another project to produce the electricity Bango is supposed to generate. There is no substantiation of this assumption.

There is a section 4.6.2 headed "Layout and alternatives" which says why CWP likes the location for a wind farm but which does not identify any feasible alternatives to the development, let alone provide any analysis of the "costs and benefits of the development relative to alternatives". Nor does any other section of the document provide an analysis of feasible alternatives relative to the proposed project.

In section 4.5 "Suitability of Wind Power" the EIS provides some brief assertions about the economics of wind versus other power sources, which mention the existence of solar as a source. It is noticeable that the comparison of relative costs in the section is from 2008 and 2009, i.e. almost a decade ago.

Given that, at the time of submitting the EIS and then the RTS, there were a large number of other wind and solar farm proposals submitted to government in NSW and other states, as well as a substantial number which had been approved but yet to be completed or even start construction, any assertion that without the Bango project the purported output of "renewable" electricity would not be provided is suspect and requires a reasoned substantiation for the claim.

Since s7(1)(c) requires that "an analysis" must be provided, in the face of many publicly known competing proposals, simply asserting the electricity will not be provided, as the EIS suggests, does not constitute *an analysis*.

The claims about the alleged local economic benefits of the project are specious and unsubstantiated and there is no reference to the accompanying economic costs. Most of the claimed investment would be in the capital cost of turbines, imported from overseas, with no benefit to either the local area or Australia generally. Other parts of the investment are in hiring specialists wind farm constructors as well as sundry consultants, few of whom, if any, are located in the locality. In addition, the operating control of wind farms is now increasingly done from control rooms located overseas, not by local employees.

On the other hand the wind farm would deter future development in the area, which brings direct support to the local economy and its tradesmen, as well as the future normal living purchases that accompany a growing local population. None of this is mentioned in the claims by CWP Renewables (CWPR), let alone any attempt to assess their relative magnitude.

There is a further relevant omission from the EIS. The Bango EIS nowhere provides a clear statement of the objectives of the development (despite s7(1)(b) making that mandatory also).

It does contain a statement of purported benefits[1]:

- "Production of approximately 575 to 1,025 GWh per annum, equivalent to 1.7 to 3% of the revised 33,000 GWh Large-Scale Renewable Energy Target"
- "Displacement of greenhouse gas emissions between approximately 500,000 and 875,000 tonnes of CO_2-e per annum"
- "Provision of local jobs, a Community Fund to benefit the local area in the vicinity of the Project and the injection of up to $365 million into the Australian economy"
- "Improved security of electricity supply through diversification"

Virtually any SSD project could, and probably does, purport to produce the third of those "benefits". But such benefits are normally incidental to a project rather than the reason for undertaking it.

The fourth purported benefit is "improved security of electricity supply". In fact this proposal would actually reduce electricity security because the output of Bango wind farm will be sporadic and unpredictable and certainly not "on-demand", which is what electricity customers want. It will also force coal-fired generators to operate in a sporadic and inefficient way as they are ramped up and down to adjust to the fluctuating output from Bango wind farm. This is something which was not a problem when almost all Australian electricity was generated through non-diverse coal-fired power stations.

[1] *EIS Main Report*, p. 17.

Further, the proposed location of this wind farm in the middle of a number of others means it is subject to similar weather conditions and will fail to produce power at the same time as those around it also fail. Consequently, it would not provide diversity of wind-powered electricity supply. So rather than improving "security of electricity", it will degrade security of supply.

Providing a list of benefits is not the same as providing a "statement of the objectives of the development, as required by s7(1)(b) of Schedule 2 of the Regulation.

Nonetheless, despite that omission, one might reasonably deduce from the document that the objective of the project is *to generate utility scale electricity from a "renewable" source*. Subsequent consideration in this document takes that as the objective of the development.

The EIS in relation to s7(1)(c)

In short, s7(1)(c) requires the EIS ***must*** provide

> "an analysis of any feasible alternatives to the carrying out of the development, . . . , having regard to its objectives"

That requires two things be done:

1. Identification of feasible alternatives, having regard to its objectives
2. Provision of an analysis of each of those feasible alternatives, particularly their environmental costs and benefits relative to the proposed project (as explicitly stated in the SEARS).

Feasible alternatives

Given what is understood to be the objective of this project, the first requirement would exclude coal and gas fired electric generating plant since, while of *utility scale,* they are not what is accepted as a *"renewable" source*. Likewise it would probably exclude rooftop solar systems. They qualify as a *"renewable" source* but generally are not of *utility scale* (though at some point operators may find ways of harnessing sufficient numbers to constitute that scale).

However, the following types of project all appear to be ***feasible*** alternatives if the objective is *to generate utility scale electricity from a "renewable" source*:

- a wind farm located elsewhere;
- a solar farm located elsewhere;
- a solar farm in the Bango locality.

DPE has an extensive list of wind farm and solar farm projects spread throughout NSW. The proposals all claim they will produce renewable energy and that appears to be the general objective of all of those proposals.

Dictionary definitions of *feasible* include:

- capable of being done or carried out (Merriam-Webster Dictionary)

- possible and practical to do easily or conveniently (Oxford Dictionary)
- able to be done or put into effect (Collins Dictionary)

While the Oxford Dictionary definition includes the qualifier "easily or conveniently", in this context that would reasonably mean with an ease and convenience comparable to constructing and operating the proposed project.

In fact, the EIS does not consider any of the feasible alternatives noted above. It does not mention the possibility of a wind farm located elsewhere or a solar farm in the project locality or elsewhere as feasible alternatives given its objectives.

It mentions solar energy exists but makes no comment about it as a feasible alternative to the proposed project. It provides no analysis whatsoever about solar farms either at the Bango location or elsewhere as an alternative way of meeting the project objectives.

As of 31/12/2017 DPE's major projects site listed 48 solar farms with combined capacity over 6,100MW at various stages of approval. Two of those proposals are from CWPR, or its associates. Of those two, the Sapphire solar farm has similar capacity as the Bango wind farm and the Sundown solar farm is proposed to have twice the generating capacity of the Bango wind far.

So almost certainly a solar farm somewhere in NSW is a feasible alternative to the specific Bango proposal and the developer knows that from their own experience and their own proposals elsewhere.

The EIS also fails to apply the same thinking to wind resources. There are substantial unused wind resources not just in Australia as a whole but in NSW. Consequently, a wind farm elsewhere in Australia or NSW with far fewer social and environmental impacts is a feasible alternative.

The developer, CWPR, is well aware of the potential for wind farms elsewhere in NSW and Australia, and indeed solar farms. The EIS claims[2] the parent companies of CWPR have extensive experience with wind farms, including approval for others in Australia and that they have "interests in solar" though their "primary focus remains in wind energy". Indeed, as noted above, CWPR has lodged at least two solar farm applications with DPE, being the Sapphire solar farm and the Sundown solar farm. The Sapphire solar farm got one objection. The Sundown solar farm has yet to go on exhibition.

Thus CWPR knows of potential wind farm sites which are feasible alternatives to Bango and it knows of solar farm sites as feasible alternatives. Perhaps Bango looked more profitable to the company than the alternatives or perhaps they thought it would be easier to steamroller the community in that area. None of those reasons absolve CWPR from the s7(1)(c) requirement to provide some analysis of those or other alternatives, since the information required by the Regulation and the SEARS is about environmental impacts, not profitability or convenience for the company.

[2] *EIS Main Report*, p.4.

Analysis of feasible alternatives

The second part of the task required by s7(1)(c) is to provide an *analysis* of those feasible alternatives.

Again, dictionaries give us some clarity on this point. Dictionary definitions of *analysis* include:

- a detailed examination of anything complex in order to understand its nature or to determine its essential features **:** a thorough study (Merriam-Webster Dictionary)
- detailed examination of the elements or structure of something (Oxford Dictionary)
- an analysis is an explanation or description that results from considering something carefully (Collins Dictionary)

Critical words that occur in those definitions are *detailed examination*, *thorough* and *careful*. There is in fact nothing *detailed, thorough* or *careful* in the EIS in relation to any alternatives.

Providing a list of possibilities is not an analysis. However, as we have seen, the EIS does not even provide a statement of feasible alternatives, let alone an analysis of them.

The issue for the consent authority is not what will make most money for the proponent but what are feasible alternatives for achieving the objective and what are the environmental consequences of those alternatives. That is what s7(1)(c) requires be provided in the form of some analysis, so the consent authority can make a merit decision taking that information into account.

How extensive does an analysis have to be in order to satisfy s7(1)(c)?

It is quite common for any business or government agency, contemplating a new project (factory, distribution centre, office, IT facility, transport hub, etc), to consider various options for the form and location of the project. The process normally involves analysis of sufficient detail for the organisation to make a reasonable choice between the various options and then focus on a preferred option for which a far more extensive analysis is developed.

In this process, the organisation is likely to consider things such as population near the various option locations, transport access and problems, access to necessary inputs, cost factors associated with the different options, extent of externalities and the relative impact in the different locations, whether the project is likely to attract opposition and, if so, differences between the locations.

Professional organisations normally quantify values for the alternatives on each of the criteria pertinent to choosing between the alternatives. There is normally a repeatable and defensible analysis underlying the determination of those scores and the evaluation of them in totality to determine the preferred option.

s7(1)(c) is framed in the context of the *Environmental Planning & Assessment Act 1979* and the Objects of that Act with the intention of providing consent authorities with the information necessary to make informed merit decisions consistent with the Objects of the Act. For that reason, the focus is primarily on environmental factors (including impact on

communities and people) rather than on some of the commercial factors which a company would consider in making it own evaluation of alternatives.

When considering a proposed wind farm relative to other feasible alternatives for utility scale "renewable" electricity, there are a number of readily identifiable aspects for which a consent authority should require information and analysis to be provided in order to comply with s7(1)(c). They are not onerous or difficult for any company doing a professional evaluation of a project that supposedly involves hundreds of millions of dollars investment.

The following table lists a number of them, with indicative comparisons between wind farms and solar farms, and provision for specific data about the proposed Bango wind farm. DPE and other NSW government agencies may have other aspects to suggest. Were the IPC to examine the EIS and DPE assessment for a few solar farms, they would quickly see the huge difference in environmental impact typical between wind farms and solar farms.

Aspect	Bango WF	Wind Farms	Solar Farms
Potential operational noise impact		Local pop dependent, typically substantial	Nil
Potential construction noise impact		Dependent on terrain and local pop	Generally lower than wind farms
Potential visual impact		Local pop dependent, usually large	Limited
Potential avifauna impact		Locality dependent	Nil
Intrusion on protected use land zones		Locality dependent	Locality dependent
Potential flora impact		Locality dependent	Locality dependent
Potential native animal impact		Locality dependent	Little
Potential impact on aerial firefighting		Significant	Nil
Construction impact on roads and safety		Locality dependent, typically substantial	Less (no turbines/blades/ towers or massive foundations)
Potential impact on mobile phone reception		Locality and pop dependent	Nil
Potential impact on broadcast reception		Locality and pop dependent	Nil

For the sake of satisfying s7(1)(c), it would probably be appropriate to examine some specific alternatives to the Bango project, which CWPR is in a position to do but has chosen not to do.

The purpose of s7(1)(c) is clearly not just to have the information presented but to encourage developers to conscientiously consider alternatives before focusing on a preferred project so that they do not become over-invested in a badly flawed proposal.

Summary of the EIS Response to s7(1)(c)

The EIS does not discuss any *feasible* alternatives to the project, let alone provide any analysis for those alternatives.

As noted above, there are feasible alternatives to the project in order to meet the apparent objectives of the project. The aspects of those projects on which information and analysis is required in order to sensibly compare them with the Bango project in relation to the Objects of the Act are quite obvious and most are listed in the table above. The EIS contains none of that information and analysis.

In addition, the EIS does not provide any analysis to satisfy the s7(1)(c) requirement to provide an analysis of the consequences of not proceeding with the project. The EIS simply indicates, without any analysis, that the result would be to forego the amount of "renewable" electricity that the proposal is to be capable of producing.

Yet there are a large number of other "renewable" electricity projects at various stages of proposal or development, including many that have been approved and yet to be built, many awaiting assessment, and many new solar farms proposed to the NSW DPE.

In its assessment of the Jupiter wind farm proposal, the Department stated:

> "The Department considers there is a suite of renewable projects (including both wind and solar) either approved and not constructed or currently in the assessment process that also have the capacity to provide renewable energy in NSW." [3]

The state and national requirement for "renewable" electricity is driven by the Federal Government's Renewable Energy Target (RET). At a press conference with the Prime Minister, the Federal Minister for the Environment and Energy said "The best advice to me is that the RET is 95 per cent done." [4]

In the context of the Energy Minister's statement, published documentation from Federal agencies such as AEMO about the pipeline of other approved and proposed "renewable" electricity projects and DPE's own public records, a simple assertion of electricity that would allegedly be foregone, without any presentation and consideration of industry data, does not constitute an analysis.

The EIS wholly fails to satisfy the mandatory requirements of s7(1)(c).

The CWPR Response to Submissions

Having failed to meet the requirements of s7(1)(c) in the EIS, CWPR had an opportunity to remedy the situation in its Response to Submissions (RTS) following the public exhibition of the EIS. It did not do so.

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[3] *State Significant Development Assessment Jupiter Wind Farm (SSD 6277) Assessment Report*, Department of Planning & Environment, February 2018, p. 4.

[4] *Press Conference with the Minister for the Environment and Energy and Members of the Energy Security Board*, Prime Minister of Australia, 17 October 2017.

A number of objections to the Bango wind farm on public exhibition proposed solar power instead. The Bango RTS response was:

> **Response:** While it is agreed that solar power is an excellent option for renewable power generation, it is also more expensive than wind and has a much larger footprint per kWh of energy produced.
>
> The footprint of 1MW (capacity) of solar panels is approximately 20,000 – 25,000 m^2 (2-2.5 ha). Taking into account access tracks, hardstands and foundations, the footprint per MW (capacity) for the Bango wind farm is approximately 2,000 m^2 (0.2 ha).
>
> In addition, the average capacity factor for solar electricity production in NSW is about 22%, the equivalent capacity factor for wind is about 35%. So not only does 1 MW wind have about 10% of the footprint of 1MW solar, but it also produces about 13% more electricity.

As can be seen, the response provided no analysis of solar farms compared to Bango wind farm in terms of actual impact on the community and the local environment.

Instead it made two irrelevant claims. First it claimed the physical footprint of a wind farm was smaller per MW than for a solar farm. Leaving aside the validity of that assertion, which depends on questionable assumptions about what to include in a footprint calculation, "so what?" No one objects to a solar or wind farm on the basis of the size of its physical footprint. Objections are often made about interference with particular sensitive environments and habitats. The objections are locality specific, focused on the particular environment that may be harmed. They are not abstract objections about the size of the footprint. In addition, it is well known that wind turbines kill avifauna. That is a serious environmental impact. It is related to the location and swept area of the turbine rotors, and has nothing to do with the on-ground footprint of the wind farm. PV solar farms (the norm in Australia) do not kill avifauna. This specious claim by CWPR is totally irrelevant to a comparison between wind and solar farms in relation to matters to be considered by consent authorities.

The second claim is that wind turbines have a capacity factor of 35% and solar farms about 22%, i.e. the actual output over time is respectively 35% and 22% of the output if they were continuously (24/7) exposed to the optimum level of wind or sun. If that was a compelling argument, then it would be for coal-fired power stations since their capacity factor is far higher than either wind or solar. Since the operating input for both wind and solar is free and there is an enormous amount of such capacity unused in the state, the capacity factor is a total non issue.

In addition, there is another important difference between the two sources. That is the degree of correlation between electricity demand and electricity generation from these sources. Solar power is produced only during the day and, as such, tends to have a fairly high correlation with demand. Wind power occurs randomly day and night, with a substantial proportion generated at periods of low demand which would otherwise be met by on-demand coal-fired generators, which the electricity system requires in any case in order to provide security of supply for when wind or sun are absent and also to provide frequency and other services to ensure stability across the grid. The higher capacity factor is of little social use if a lot of that capacity occurs when it is not needed.

A difference in capacity factor would be relevant only if it made solar farms not financially viable. However, since CWP has proposed several solar farms in NSW and many other developers have proposed and are building or operating solar farms in NSW, it is quite clear that solar farms are viable and the statement about different capacity factors is wholly irrelevant.

Thus the only response by CWPR to suggestions of a solar farm instead of Bango wind farm is a couple of nonsense arguments. That clearly demonstrates there are no rational and valid arguments against a solar farm as an alternative. Therefore the only reasonable conclusion is that CWPR having spent time and money on this proposal, without taking proper account of the adverse impact on the community and how much less it would be with a solar farm in this location or some other, wants the IPC to turn a blind eye to the alternatives and bless the careless and harmful proposal it made with the Bango wind farm.

The RTS has provided no analysis of feasible alternatives, despite having been challenged by objecting submissions and despite the developer knowing that s7(1)(c) requires the analysis be provided. This is *prima facie* evidence that the developer knows the provision of such an analysis would be damning to the project.

Apparent offence under s10.6 of EP&A Act – false or misleading information

The failure of CWPR, and of Mr Ed Mounsey who signed the EIS, to comply with section 7(1)(c) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, appears to be also an offence under section 10.6 (formerly s148B) of the *Environmental Planning and Assessment Act 1979*. Section 10.6 of the Act indicates it may also be an offence against certain sections of the *Crimes Act 1900*.

Section 10.6 says:

> "A person must not provide information in connection with a planning matter that the person knows, or ought reasonably to know, is false or misleading in a material particular."

It is well understood that wind farms are likely to have particular adverse environmental effects on both the natural environment and on landowners and other residents. That is why DPE has produced its *Wind Energy Planning Framework*, with extensive bulletins on noise impact and visual impact.

Indeed, the Visual Assessment Bulletin states:

> "For example, in the case of Taralga, the Chief Judge of the Land and Environment Court found that, in that specific case, the public interest in renewable energy outweighed the visual, noise and other adverse impacts of the proposal."[5]

[5] *Wind Energy Visual Assessment Bulletin*, Department of Planning & Environment, December 2016, p. 3.

and the Bulletin repeats that comment multiple times, making clear there is, in DPE's view, extensive adverse impact from wind farms which may be outweighed by the public interest expressed by government policy favouring renewable energy.

However, the expressed policies at both State and Federal level are to promote renewable energy, not specifically wind energy. There are alternatives for that purpose, including solar, biomass and hydro.

The IPC, as the consent authority, is required to make decisions taking account of the environmental consequences of proposals, including that on people. If considering a project, of any sort, and there are alternative ways to meet the objectives of the project which would have far less adverse impact on people and the broader environment, then that is material information for the IPC to consider.

Failing to comply with s7(1)(c) in relation to the Bango wind farm, when solar farms and other wind farms are clearly feasible alternatives to meet the objectives of the project is to provide information that is "false or misleading in a material particular" through omission. In addition, not only ought the developer to reasonably know it is false or misleading in that material particular, we can say with certainty that it, and its signatory, do know they have omitted relevant information.

The application for SEARS for the Sundown solar farm has been signed by Ed Mounsey, the same person who signed the EIS for the Bango wind farm. Both projects have the same postal address, as does the EIS for the Sapphire solar farm. Thus, there can be no doubt that those involved in lodging the Bango EIS and then the RTS for Bango are well aware that solar farms are a feasible alternative to the Bango wind farm for the purpose of producing utility scale renewable energy.

The company's website (18th March 2018), also claims the company has other advanced wind farm developments, being Sapphire wind farm, Crudine Ridge wind farm and Unngula wind farm. Thus, their own web site shows they know wind farms in other locations are a feasible alternative to the Bango wind farm for meeting its objectives.

By knowingly refusing to comply with s7(1)(c), the developer and its signatory appear to have breached s10.6 of the *Environmental Planning and Assessment Act 1979*, and as noted below s10.6, may have also breached sections of the *Crimes Act 1900*.

Conclusion

1. The EIS submitted for the Bango wind farm does not contain the analysis which section 7(1)(c) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* says is mandatory – not an optional extra.
2. Instead it contains a few paragraphs which consist of self-serving assertions with absolutely no substantiation provided for those assertions and nothing which qualifies as even a minimal *analysis* of *feasible alternatives . . . having regard to its objectives*.
3. There are actually a number of *feasible alternatives . . . having regard to its objectives*, which have been identified in the discussion above. None of them are identified in the EIS, let alone subject to any analysis in the EIS.

It has thus been demonstrated that the EIS does **not** contain:

> "an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure"

Since the project is counter to the interests of a large number of residents in the region, acceptance of the proposal would be prejudicial to the interests of those individuals.

The developer has had several opportunities to comply with section 7(1)(c). First when it submitted an EIS, and then when it submitted a response to the objections raised against its EIS at public exhibition. At each opportunity to comply with a mandatory planning requirement, the developer has refused to do so.

In so doing it has refused to provide information without which the consent authority cannot make a valid merit decision consistent with the Objects of the Act in its favour. The developer has also denied members of the affected community information required under the Regulation which would have allowed them to better understand the implications of the project and formulate their submissions to government. Acceptance of the developer's proposal under these circumstances would be an overt act of procedural unfairness and bias by the consent authority.

The developer's failure to comply with s7(1)(c) appears to place them in breach of s10.6 of the Act, which prohibits the provision of materially false or misleading information in connection with a planning matter.

Unsubstantiated VI Assessment

Dr Michael Crawford

21st March 2018

The IPC is obliged to itself make the judgements on the visual impact that will be experienced from the Bango wind farm and on whether that is acceptable or not. It has been presented with unsubstantiated claims about VI from parties for whom the IPC appears to have no evidence of their ability to make valid and accurate assessments. It has also been effectively advised by those parties to ignore a substantial area within which empirical research indicates VI can be significant. Unless the commissioners themselves have validated skills to make VI assessments for all the potentially affected properties, they need to reject those assessments and seek ones that are substantiated and made by persons for whom the validity of their wind farm VI judgments has been proven.

Requirements for a valid wind farm VI assessment

According to DPE's Visual Assessment Bulletin [1]:

> "the consent authority must evaluate the visual impacts of a wind energy project. The consent authority will consider the proponent's visual assessment, including any proposed mitigation or management measures to be implemented before determining whether the impacts are acceptable.
>
> It is the consent authority's responsibility to determine the acceptability of those visual impacts when balanced against other social, environmental and economic considerations."

The Bulletin is clear that, in this instance, the responsibility for evaluation of visual impact, and whether it is acceptable, is solely the responsibility of the IPC commissioners and no one else, including DPE. That of course is no more than a restatement of the responsibility the commissioners have to make an independent merit assessment.

However, it leads to a question of the personal ability of the commissioners to perform this task and, if it requires skills they don't possess, upon whom they rely for advice and what expertise those advisors can demonstrate.

The Department's noise assessment process depends on the use of standardised, calibrated measurement instruments to determine background noise and for monitoring wind farm noise during operation[2]. The measurement instrument is independent of the assessor using it. Indeed, an acoustician can be deaf and still conduct an assessment using DPE noise guidelines. The same is not true of people providing a VI assessment under the Department's guidelines. They cannot do it if blind.

The VI assessments provided to the IPC depend on the assessor acting as the measurement instrument for VI, which they report on an uncalibrated, unquantified, vague scale using imprecise words and against which they imply some level of acceptability which is not empirically validated.

Given the unusual character of wind farms (enormous height of structures in a rural area, huge span of swept area, movement, etc with large numbers distributed over a very large area, often in folded terrain) the expertise for making valid assessments of impact reasonably similar to that which would be experienced by the class of people normally living in such localities and exposed to the impact is unlikely to occur incidental to other training or experience.

If the IPC is to depend on advisors as to the level of visual impact on affected properties and on those advisors as to whether the impact with or without any proposed mitigation is acceptable, then the IPC must obtain evidence that the advisors are able to accurately perform the function they purport to be doing. There is nothing in the Assessment Report to indicate its authors or their advisors possess that expertise or have been tested as able to do so, and previous evidence from DPE gives grounds for believing they have not been trained to do so or validated for accuracy in doing so.

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[1] *Wind Energy Visual Assessment Bulletin 2016*, Department of Planning & Environment, p. 25.

[2] The Federal Administrative Appeals Tribunal has made findings that invalidate DPE's current noise assessment methodology in terms of what aspects of noise it has chosen to measure and standards use to indicate acceptability, but has not invalidated the use of physical, standardised and calibrated measurement equipment.

Evidence that VI assessors are unvalidated for the task

A GIPA request to DPE revealed that, as of July 2017, the Department held no evidence of wind farm specific VI expertise, particularly in relation to the *measuring instrument* role, on the part of the main officials involved in wind farm planning, the consultants DPE used in creating the guidelines or consultants it used in producing its VI assessments for a number of wind farms. That lack of evidence specifically includes the two officials, Mike Young and David Kitto, who authored DPE's Bango Assessment Report. It is possible they have subsequently been tested and proved to be able to make accurate and reliable VI assessments but the report does not appear to provide evidence of it.

Further, at various times DPE has retained Terry O'Hanlon and Andrew Homewood as advisors on visual impact. Nonetheless, as of July last year, DPE reported not holding any evidence showing either individual had undertaken training to accurately assess the visual impact of wind farms or that they had been tested for their ability to make accurate assessments. Mr Homewood is apparently the author of the Bango developer's VI assessments and Mr O'Hanlon is apparently DPE's independent advisor on VI for Bango wind farm.

The GIPA request sought, for each of those individuals (authors and advisors), records held by DPE which show that the individual:

1. has undertaken any formal courses in order to learn how to accurately assess the visual impact specifically of wind farms or similar infrastructure;
2. has been tested for their ability to make accurate assessments of the visual impact of wind farms or similar infrastructure, and their score on those tests;
3. has been tested for the degree to which their assessments of the visual impact of wind farms or similar infrastructure are consistent with the visual impact judgements made by residents to the impact and their consistency scores.

DPE responded[3] to the GIPA request by advising that the Department held none of the information covered by points 1, 2 and 3 above, for any of the individuals (DPE officials and specialist visual impact advisors) involved in producing DPE's assessments and recommendations for Biala, Crudine Ridge, Rye Park, and Yass Valley wind farms, nor for its advisors in producing its Wind Energy Visual Assessment Bulletin 2016.

Likewise a GIPA request in relation to determinations on particular wind farms revealed that, as of October 2017, the PAC held no evidence of wind farm specific VI expertise on the part of any of the commissioners who made determinations for four nominated wind farms (Biala, Crudine Ridge, Rye Park, and Yass Valley). John Hann, who chairs the IPC panel for Bango wind farm, was amongst that group of commissioners about whom the PAC said it held no relevant records. The other two Bango commissioners, Carol Austin and Paul Forward, were not part of the group for whom information had been sought in the GIPA request.

Absence of evidence is not evidence of absence but equally a consent authority cannot simply assume a decision maker or a critical advisor has necessary specialist expertise without that having been proven. If evidence of that expertise has been acquired since the earlier GIPA requests, it should be included in documents before the IPC panel for this proposal.

[3] File Ref: GIPAA – 2016/17-091 – IR, 20 July 2017.

Determining the visual impact of wind farms is a unique task, unlike all other forms of visual assessment in rural areas, and indeed urban areas. To be done validly and reliably it depends on skills not formed without specific training.

Accepting any assessment done by individuals who are unable to provide the evidence specified in points 1 – 3 in the GIPA request described above would be procedurally unfair to the affected community.

Rater bias and unreliability

There is readily available research evidence of the unreliability and bias of those who may be considered VI "experts" (Appendix A). The IPC can see immediate evidence in the inconsistencies between VI assessors for Bango wind farm and also for Jupiter wind farm.

The following table summarises result for viewpoints for each of Bango and Jupiter for which the developer's consultant and DPE's independent reviewer produced assessments. For Bango there were 26 such viewpoints and the independent viewer and BWF's consultant agreed on only 8. In all instances of disagreement the rating given by the BWF consultant was lower.

For Jupiter there were 42 viewpoints evaluated by both the wind farm's second consultant and DPE's independent reviewer. They agreed on only 9 ratings out of 42, with the wind farm's consultant generally giving lower ratings. (Note. There was much higher agreement between the independent reviewer and the wind farm's first VI consultant.)

	Bango	Jupiter
Number of viewpts compared	26	42
Number in agreement	8	9
Number in disagreement	18	33
Avg difference (DPE - Developer)	1.2	1.7
For diff score: Neg = 0; Low = 2; Med = 4; High = 6		
plus intermediate values: Low-Med = 3		

It is important to recognise that these were not blind ratings. In each case the independent reviewer was aware of the ratings given by the other consultant. When one person provides ratings with the knowledge of what a previous rater has done, it tends to produce closer ratings between the pair than if each provides their ratings with no knowledge of what is done by the other (the normal conditions for determining inter-rater reliability).

There is a further factor. In 2013, the US National Academies (which advises the US Government on scientific and technical matters) published an extensive review of methodologies for VI assessment and related research. In relation to visual quality and visual impact it stated:

> "The differences between what professionals value and what the public values is profound." [4]

[4] *Evaluation of Methodologies for Visual Impact Assessments, NCHRP Report 741*, Transportation Research Board of the National Academies, Washington DC, 2013, p 139.

The word *profound* is a strong one to characterise differences. The four authors of the report are US and UK landscape design and visual impact professionals, with two in private practice and two in university positions, so the characterisation is not made by people either ignorant of or opposed to "visual experts" typically used for VI assessments.

It appears none of the persons providing VI assessments in relation to the Bango wind farm has been explicitly trained in judging wind farm visual impact, nor do they appear to have been tested for the reliability of their assessments or for the consistency of their assessments with those that would be made by the relevant population of people in live in wind-farm affected localities.

Thus, the IPC has been provided with unsubstantiated assessments of VI made by individuals for whom the IPC appears not to have any proof of their ability to produce valid wind farm VI assessments.

Distance of VI and exclusions in assessments provided to IPC

Empirical research has shown that for wind farms with 200m high turbines, the threshold for visual dominance of the landscape is around 11 kms, and the threshold for visual pre-eminence ("the wind facility is a major focus of visual attention, drawing and holding visual attention") is well over 20 kms. This is documented in the attached paper *What Empirical Research has Established about Wind Farm Visual Impact* [5].

If a wind farm or its parts can dominate the view, or be a major focus of visual attention, then it is certainly capable of having a large visual impact in a rural setting. The published research clearly indicates a need to evaluate the visual impact on all dwellings out to 11 kms (excluding those which mapping software demonstrates will physically have no view of the wind farm) and arguably much further within the visual pre-eminence threshold.

The assessments provided to the IPC ignore most of the dwellings beyond 4 kms on a basis which is essentially "we don't think there will be much impact" (without actually showing that to be true). This assertion is made by people for whom the IPC (and the public) appears not to have any documented evidence of their ability to make accurate assessments of actual VI from wind farms.

Conclusion

As well as providing VI assessments for a number of properties, the DPE Assessment Report recommends that a substantial number of properties within 4 kms of the wind farm should receive no relief or compensation but be given the right to claim "visual mitigation" from the developer. That, of course, means some degradation of the views from those properties. The Department has produced no evidence that would allow the IPC to conclude the degradation would be acceptable in terms of the extent of adverse impact. Nor has the Department provided any evidence demonstrating that those who produced this recommendation have the ability to make valid judgements on the matter.

On the evidence currently in the public domain, neither the IPC commissioners, nor DPE officials, nor VI advisors employed by DPE or the developer, have a demonstrated ability to

[5] *What Empirical Research has Established about Wind Farm Visual Impact*, Dr Michael Crawford, March 2018.

make accurate and valid assessments of the actual visual impact on individual properties from a wind farm. Further, there is solid research evidence showing high levels of unreliability in judgements by individual "VI experts", that their judgements tend to be profoundly different from the public (i.e. the relevant parties experiencing VI), and that bias exists among "VI experts" in their views about impacts.

In addition, the assessments provided to the IPC appear to ignore potentially affected properties within the thresholds for visual dominance and visual pre-eminence from the Bango wind farm, and they do so without offering any evidence to substantiate those exclusions except the opinions of those providing the assessments.

The IPC is obliged to itself make the judgements on the visual impact that will be experienced from the Bango wind farm and on whether that is acceptable or not. It has been presented with unsubstantiated claims about VI from parties for whom the IPC appears to have no evidence of their ability to make valid and accurate assessments. It has also been effectively advised by those parties to ignore a substantial area within which empirical research indicates VI can be significant.

Unless the commissioners themselves have validated skills to make VI assessments for all the potentially affected properties, they need to reject those assessments and seek ones that are substantiated and made by persons for whom the validity of their wind farm VI judgments has been proven.

Appendix A: Unreliability and bias of VI "Experts"

Research showing unreliability of VI "Experts"

All measurement, whatever the subject and however it is done, contains some error. For some forms of measurement the amount of error is likely to be very small. For some forms of measurement it may be quite large, in which case the existence of error is important if decisions are made based on the results of the measurement. It is critical when making decisions to understand the degree of error likely to be part of any measurement being used and whether that may render decisions unsafe.

Any reported measurement has two components: the underlying reality which is being attempted to be measured plus some amount of error. This is true whether the measurement is of the weight of goods on a scale, or the amount of petrol which the scale on a bowser indicates was delivered, or a dB(A) noise level reported by an acoustics monitor, or the "scenic beauty" categorisation of a view reported by a VI consultant.

There are broadly two main types of error in measurement: random error and bias. If, a measurement instrument, on average, gives values less than the true values, then it is biased, and likewise if on average it gives values more than the true values. There are reasons to suspect some degree of bias in the advice of VI consultants engaged in wind farm VI assessments. They will be discussed subsequently.

The other form of error is random error. It is generally captured under the term reliability, being how close to the real value are measurements provided by a particular instrument, after adjusting for bias.

For most measurements relating to the physical world, e.g weight, or volume, or sound pressure, there are precise definitions of the thing being measured, so that the "real value" can be determined with great exactness. Instruments used in practice may be limited in their precision (e.g. for economic reasons) but they can be compared with more precise ones and their level of imprecision or unreliability determined. That function is performed by bodies such as the Australian National Measurement Institute.

With subjective matters, such as gymnastics or scenic beauty, or teacher assessments of student classroom behaviour, there is no defined physical reality that can measured. Instead, evaluation of reliability is done using the concept of inter-rater reliability, i.e. if different people give ratings of the same subject, how close do their ratings tend to be. The "different people" may be selected from a specific group, such as "VI professionals" or "people living in rural localities" or "the general public".

Scientifically based statistical methodologies have been developed to calculate the reliability of members of such groups when providing subjective estimates. These have been applied to subjects such as scenic descriptors like *form*, *colour*, *texture*, *complexity*, and *intactness*, all the sort of characteristics that make up evaluations of "scenic quality" in the guidelines.

The National Academies review *Evaluation of Methodologies for Visual Impact Assessments* includes some detailed discussion on reliability of assessments of landscape attributes [6]. The

[6] *Evaluation of Methodologies for Visual Impact Assessments, NCHRP Report 741*, Transportation Research Board of the National Academies, Washington DC, 2013, pp. 33-40.

discussion includes several data tables drawn from a number of research studies of reliability of rater assessments of landscape characteristics. The single person reliability values generally fall in the range 0.2 – 0.5.

The maximum possible value on a reliability index is 1. One of the most influential scholars on reliability and its consequences was the psychometrician J.C. Nunnally. He provided a widely accepted set of benchmarks for acceptable reliability levels for different purposes, including research and clinical or other important decisions. Nunnally advised that:

> "In those applied settings where important decisions are made with respect to specific test scores, a reliability of .90 is the minimum that should be tolerated, and a reliability of .95 should be considered the desirable standard." [7]

As is immediately evident, the reliabilities of landscape ratings are nowhere near the minimum level required as a basis for important decisions. On that basis, the authors of the National Academies review concluded [8]:

> "Reliability of a single evaluator is insufficient for professional level assessments."

noting

> "This led Feimer and Craik to conclude that "for all rating formats, the use of single raters results in a level of reliability that falls far short of acceptable psychometric standards" (Feimer and Craik 1979, p. 2728). Reliability of FHWA vividness, intactness, and unity (measured from 234 responses by Clay and Smidt [2004] for the small number of experts used to conduct assessments would be much lower than would be acceptable for a VIA [Palmer 2000])."

None of this is mentioned in DPE's wind farm Visual Assessment Bulletin nor has the Department offered any proposals that might ameliorate the problem. The guidelines give the impression that visual assessments made by VI consultants, whether employed by developers or DPE, can be assumed to be highly reliable. Real world evidence shows they are not.

Potential bias of VI consultants

As discussed, unreliability refers to random imprecision in assessments. The other major form of measurement error is bias.

Note, bias does not require intentional dishonesty, though that remains a possibility as in any commercial transaction. Bias may arise simply from the internal beliefs and mental frame of reference of people making an assessment.

In relation to wind farm VI assessments, bias is not just a theoretical possibility. There is research which gives reason to consider it likely.

Research has demonstrated that "The addition of wind turbines was almost universally perceived as a negative impact on the landscape scene"[9] and that "Similarly to Johansson and

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[7] Nunnally, J.C. *Psychometric Theory*, McGraw-Hill, New York, 1978, p. 245.

[8] *Evaluation of Methodologies for Visual Impact Assessments, NCHRP Report 741*, Transportation Research Board of the National Academies, Washington DC, 2013, p. 37.

Laike[10], the only characteristic of the respondents that significantly influenced their preferences for wind turbines in our study was their attitude towards wind power."[11]

Molnarova and colleagues showed that ***people who are pro wind energy consider the impact of wind turbines on a landscape as less negative than do people who are tolerant of wind power or simply indifferent to it*** (my emphasis), and that these differences in perception are substantial and highly statistically significant. They also found ***this is the case irrespective of whether the rater is what might be called a landscape expert*** or anyone else, and irrespective of whether they live with wind turbines in their locality or not [12].

Thus while someone who is pro wind power is still likely to see some negative effect from wind turbines on a rural landscape, they will tend to rate that impact as being a lot weaker than the rest of the community, including the large part of the community that has no firm views one way or the other about wind power.

It is reasonable to assume that consultants hired by wind farm developers are pro wind power. Since developers get to choose who works for them it would certainly be surprising if they chose consultants opposed to wind farms. Even to hire ones who are ambivalent seems unlikely.

DPE is working for a government that is committed to the construction of more renewable energy facilities in NSW and which has advocated wind farms. It is therefore reasonable to expect relevant DPE officials to be pro wind farms. The Department has certainly hired some VI consultants who have a history of working for wind farm developers.

VI consultants who work on wind farms are hired either by wind farm developers or by DPE. They are not hired by communities adversely affected, who are rarely in a position to do so. Consequently, while it is not guaranteed that every VI consultant engaged by a developer or DPE is pro wind farm, any reasonable person would conclude that most of them will be, and that bias will affect their opinions so that, as research has shown, they will tend to diminish the anticipated adverse impact of a wind farm.

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[9] Molnarova K., Sklenicka P., Stiborek J., Svobodova K., Salek M., and E. Brabec, "Visual Preferences for Wind Turbines: location, numbers and respondent characteristics", *Applied Energy* 92 (2012): 269-278, p. 19.

[10] Johansson, M. and Laike, T. "Intentions to respond to local wind turbines: the role of attitudes and visual perception", *Wind Energy* 2007: 10:435-451.

[11] Molnarova, et al, p. 17.

[12] Molnarova, et al, Figure 6, p. 15.

What Empirical Research has Established about Wind Farm Visual Impact

Dr Michael Crawford

13th March 2018

ABSTRACT

The substantial body of empirical research now available on wind farm visual impact (VI), from very credible and impartial teams, shows a consistent and essentially linear relationship between turbine height, distance and wind farm visual prominence. For any degree of visual prominence (such as the zone of visual influence, or threshold for visual dominance), if turbine height is doubled, the distance threshold for that degree of impact also essentially doubles.

The research also identifies a number of other factors pertinent to wind farm VI assessment, in particular relating to the importance of blade movement for VI, the fact that photomontages tend systematically to underestimate VI, and that the assessment frameworks commonly used are too simplistic to describe real world experience.

Contents

Wind farm visual impact

Visual impact (VI) is an important factor in the evaluation of proposed wind farms. Historically judgements about wind farm VI have been made in a way essentially devoid of scientific observation, relying instead on the opinions of bureaucrats and their advisors. There is now a substantial body of systematically collected, consistent, empirical evidence from multiple studies of wind farm VI such that wind farm VI assessments made without reference to that evidence cannot claim objective validity. This paper discusses that empirical evidence.

Modern wind farms are highly visible structures because of both the height of turbines and their number and geographic distribution in a wind farm. It is common for planning authorities to require some form of VI assessment for proposed wind farms.

Wind farms typically involve a conflict of interests among various parties, on one side the proponents and on the other those who will be affected in various ways by the VI, noise emissions, etc from the wind farm. Predominantly those affected are people who live in some area around the wind farm.

In the early years of wind farm development, there was little systematic empirical basis for planning authorities attempting to assess wind farm VI. In that context, planners made what probably seemed reasonable judgements at the time, to some extent following one another.

However, over time, observational and research data relevant to VI policy has been accumulating. Inevitably it has largely lagged wind farm developments, since the most powerful research has depended on the existence of wind farms with turbines of particular heights as the observational subjects.

At the same time, planners have been subject to growing pressures over wind farm approvals. Many governments have decided, as a matter of policy, to encourage wind farms and want to increase their number. Wind turbine technology has been increasing the power and height of wind turbines (now 3 to 4 times what they were a couple of decades earlier) and the economics of wind farm operators encourage them to use these larger turbines. But, given the physics of optics, *prima facie* that would suggest even greater VI over ever wider areas, and thus a stronger basis for rejecting wind farm proposals. If planning processes formally recognise this situation it conflicts with the interests of wind farm proponents and would potentially block many of the wind farms governments have said they want built.

Thus there is real public policy pressure on government officials to construct VI assessment frameworks that diminish the ostensible VI. It creates a conflict between honest and impartial government practices and those created explicitly to serve certain special interests.

The problem for public officials seeking more wind farm friendly frameworks is that attempts to recraft VI assessment frameworks are happening at the same time sufficient consistent, impartial research data has accumulated to provide strong guidance on critical parts of those assessment frameworks. In addition, that empirical data may indicate previous decisions by those same agencies were flawed – something government agencies are normally loath to admit. The extent to which VI assessments by planners objectively draw on that empirical evidence, or do not, is a clear indicator of the degree of integrity of the planning processes and planners involved.

Visual impact assessment

Visual impact assessment is common in most developed countries for large scale projects such as highways, mines, big industrial structures, and wind farms (which are very large, very high industrial structures over large geographic areas).

In simple terms, VI assessment has two components: the visual prominence[1] of a development added to a viewscape; and how it affects viewers through their sense of sight (and how much attention should be given to those viewers).

This paper focuses on the first component. It relates essentially to physics and to common aspects of human visual perception. It is this area where research over the last few decades has produced the most important contribution to wind farm VI assessment.

If an object's prominence in the landscape is low, i.e. it is basically hard to see, then it cannot have much VI. It if is readily visible, then it has potential for significant VI and other factors, such as how viewers react to it in the landscape, become relevant in determining the VI.

Wind farms, as a class, generally have a common set of characteristics, which allows their visual prominence to be gauged with a few parameters.

- They consist of multiple industrial structures (each a turbine generator, driven by usually three large blades, sitting atop a high tower), with larger numbers of these structures spread over a large geographic area but close enough to be seen as a cluster or clusters.
- They are usually constructed in localities which are NOT industrial. If onshore, it is generally in rural areas (not in urban or industrial areas). If offshore, there is generally nothing but the sea around them but usually located where they can be seen from the shore. Thus they are generally totally unlike their surroundings in form and scale and consequently impinge as alien in their viewscape.
- Because they are so high[2] (modern wind turbines are commonly 150 metres high and 200 metres or more are becoming common), they can be seen from far away.

The research

There are now a number of research studies which, collectively, provide a systematic basis for determining the visual prominence of wind farms at various viewing distances. The studies, over several decades, by a number of research teams are remarkably consistent in their observations. The studies differed in the size of turbines assessed, mainly due to the era in which each study was done. As it happens, the observations of the group of studies collectively show a very strong relationship between turbine height and wind farm visual prominence.

The collective research results are inconsistent with public policy in some jurisdictions and with decisions made by planning authorities without the benefit of that research**.** Clearly a challenge for

[1] *Prominence* is dependent on several factors, including size and contrast with surroundings in terms of shape and colour.

[2] Wind turbine height is normally expressed as tip height, i.e. distance from the ground (or sea for offshore turbines) to the highest point reached by the tips of the rotating blades.

public officials is whether they bring policy in line with the substantial research now available or they seek to ignore it and pursue policy contrary to the research results.

Stevenson & Griffiths

The work of Stevenson & Griffiths is summarised in a later report by the University of Newcastle (UK) [3]:

> "Stevenson & Griffiths (1994) carried out a comprehensive post-development audit of eight windfarms in England and Wales, visiting each windfarm on up to four occasions throughout the year. Six viewpoints were analysed at each site at distances up to 20 km, although in practice topography and visibility restricted views from 10 km and prevented views beyond 16 km for all sites. . . . The case study sites included turbines ranging in maximum height from 40.0 to 61.5 (but six were within the range 40.0 – 43.5 m) and in a variety of landscape settings."
>
> "Their main conclusions are that
>
> - In most situations turbines dominated the view up to a distance of 2 km (zone (i)).
> - Turbines appear visually intrusive at distances between 1 and 4.5 km in average to good visibility (zone (ii)).
> - Turbines are noticeable, but not intrusive, at distances between 2 and 8 km, depending on atmospheric conditions and other factors (zone (iii)).
> - Turbines can be seen as indistinct elements within the distant landscapes at distances of over 7 km (zone (iv)).
>
> "For ZVI, they recommend 10 km as suitable in most conditions."

Noteworthy about the Stevenson & Griffiths research is that it involved eight existing wind farms, each of which was visited on multiple occasions and at different times of the year, and examined from multiple viewpoints. It was a practical and systematic study of what existed on the ground.

Most of the turbines in the wind farms they examined were less than 45m high. The assessments they then made about thresholds for various levels of effect were for wind farms with turbines around that height.

The visibility zones identified by Stevenson & Griffiths overlap, reflecting the fact that actual wind farm visibility is influenced by atmospheric conditions, the extent to which terrain conceals part of the wind farm, and other factors. This result is also reported by some of the other empirical studies.

University of Newcastle Study

Published in 2002, this study[4] was undertaken by a team at the University of Newcastle (UK) having been commissioned by Scottish Natural Heritage.

Similar to the Stevenson & Griffiths study, it examined multiple existing wind farms. It involved field assessment of the visual impact of eight wind farms in Scotland. It also evaluated the pre-construction environmental assessments for those eight wind farms, comparing the actual visual impact with what had been forecast.

The study team assessed 70 viewpoints, including a total of 113 individual assessments across the eight wind farms. Tip height of the turbines ranged from 53.5 – 85.5 m with the majority 53.5 –

[3] University of Newcastle (2002) *Visual Assessment of Windfarms Best Practice*. Scottish Natural Heritage Commissioned Report F01AA303A [***University of Newcastle Study***].

[4] *University of Newcastle Study*.

65.5 m. Thus they were generally higher than those examined by Stevenson & Griffiths. The number of turbines in each wind farm ranged from 9 – 46, with an average of 26.

The team reported a number of detailed observations, including:

> "the turbines are perceptible at a range of from 15 – 20 km from the windfarm and up to 25 km in specific cases and conditions"[5]
>
> "Higher turbines are visible over a larger distance"[6]
>
> "In landscapes that were free of man-made elements the turbines were sometimes much more conspicuous in the middle and long-distance ranges and this affected our judgements of their magnitude."[7]

Based on their assessment of the eight wind farms the study recommended a height-distance relationship for ZVI as shown in the following table[8].

Table 1
University of Newcastle Study ZVI Recommendations

Tip height of turbines (m)	Recommended ZVI distance (km)
50	15
70	20
85	25
100	30

The study tested the Sinclair-Thomas matrix during site visits to the eight wind farms. They concluded:

> "In general our onsite assessments were in agreement with Sinclair-Thomas at viewpoints near to a windfarm and at long distances, but we consistently rated the visual effect as either much less or lower in the middle-distance zones, or we were unable to reach a robust judgement because of a lack of differentiation in definition between distance classes."[9]

The Sinclair-Thomas matrix has 9 zones, with defined distances from the wind farm, with the bounds of each zone being a function of turbine height. So the study confirmed the Sinclair-Thomas categorisation in the lower bands of that system – and this was with wind farms with an average of 26 turbines rather than the larger numbers now common.

Sinclair-Thomas Matrix

Gareth Thomas, a planning officer of Powys County Council in Wales, developed an ordinal scale of visual impact from wind farms. He observed and identified the relation between turbine height and distance and the categories in his scale, using wind farms being installed in Wales at that time. Subsequently Geoffrey Sinclair used the same process of empirical observation, and Thomas' framework, to categorise the distance-VI relationship for wind farms with larger turbines. That became known as the Sinclair-Thomas matrix [10].

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[5] *University of Newcastle Study*, p. 51.
[6] *University of Newcastle Study*, p. 51.
[7] *University of Newcastle Study*, p. 54.
[8] *University of Newcastle Study*, p. 58.
[9] *University of Newcastle Study*, p. 61.
[10] Apostol, Dean, et. al., *The Renewable Energy Landscape: Preserving scenic values in our sustainable future*, Routledge, 2017 (Google electronic edition), p. 319.

The matrix and its production are a case of systematic observation by two experienced individuals. Given there were only two involved and the way it was developed, it fits into the hypothesis formation stage of research rather than validation.

However, substantial validation has since been provided by several sources for what are in practical terms the most important parts, i.e. thresholds for the most visually intrusive categories, and for an appropriate distance related ZVI.

The Bureau of Land Management (BLM) Study

In 2012 a report on visual impact of wind farms[11] was released by the well respected Argonne National Laboratory, which is part of the US Department of Energy[12]. The study was commissioned by the US Bureau of Land Management, so is often known as the Bureau of Land Management (or BLM) study.

The research was undertaken by staff in Argonne's Environmental Science Division and involved current and former staff of BLM, including landscape architects.

The study was a systematic examination of the visual impact of five existing wind farms in Wyoming and Colorado, with turbines 90 – 120m in tip height and most of them close to 120m [13]. The research involved 377 observations, using multiple observers, at various distances from the wind farms and rating visual impact on each occasion on a 6 point rating scale based on a standard BLM scale (used to rate proposed projects) adapted to rate existing facilities.

The study reported that:

> "Under favorable viewing conditions, the wind facilities were judged to be major foci of visual attention at up to 19 km (12 mi) and likely to be noticed by casual observers at >37 km (23 mi). A conservative interpretation suggests that for such facilities, an appropriate radius for visual impact analyses would be 48 km (30 mi), that the facilities would be unlikely to be missed by casual observers at up to 32 km (20 mi), and that the facilities could be major sources of visual contrast at up to 16 km (10 mi)." [14]

The study classed situations rated 5 or 6 as being of high impact and, on that basis, specified a *Limit of visual pre-eminence* which was 16 kms for turbines 120 m high such that:

> "At this distance, the wind facility is a major focus of visual attention, drawing and holding visual attention. . . . The facility as a whole is likely to be perceived by some viewers as having a large visual impact." [15]

Within that range of visual pre-eminence, the threshold point from which the wind farm "dominated the view" was 6.4 kms[16].

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[11] Sullivan, Robert G., et. al., 2012. *Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes*. Argonne National Laboratory and the U.S. Department of the Interior, Bureau of Land Management. USA [***BLM Study***].

[12] The US Department of Energy was certainly not hostile to wind energy. The Obama administration has been very supportive of wind farms. A page on one of the Department's sites stated "The DOE Wind Program leads the nation's efforts to research and develop innovative technologies, lower the costs, and accelerate the deployment of wind power." [http://energy.gov/eere/wind/wind-research-and-development, 20161018]. Note that commitment to "accelerate the deployment of wind power". There is no suggestion of bias in the research observations but, if there were, the disposition of the parent organisation would be to under-rate the visual impact.

[13] *BLM Study*, p. 42.

[14] *BLM Study*, p. 4.

[15] *BLM Study*, p. 41.

Offshore Study

Argonne National Laboratories subsequently conducted a study on the visual impact of offshore wind farms[17]. It was done by a somewhat different group of researchers. As with the BLM study, this was commissioned by other US Government agencies.

The methodology was fairly similar to that of the BLM study and used the same rating scale. Observations were made from multiple viewpoints for 11 offshore wind farms in the UK, whose turbine heights ranged from 107m – 153m, averaging around 128m.

The study reported that:

> "The observed wind facilities were judged to be a major focus of visual attention at distances up to 16 km (10 mi)." [18]
>
> "Distance is indeed a prime determinant of visibility for a given design, size, and color of wind turbine"[19]
>
> "Analysis of the visibility rating data indicated very good agreement between the raters. In many cases, the observers gave identical numeric visibility ratings, and in the vast majority of cases with three observers, at least two of the three were in agreement. In only two cases [out of 38] did observers differ in their numeric rating by more than one point"[20]
>
> "At night, aerial hazard navigation lighting was visible at distances greater than 39 km (24 mi)."[21]

The Bishop Study

In 2002 Bishop published the results of laboratory research on the visibility of wind turbines. It was done effectively simulating a single turbine on photographs of different backgrounds at various simulated distances and under various simulated conditions.

The work had two parts. In the first part, Bishop attempted to identify the visual static size equivalent of a wind turbine with rotating blades. In the second part, Bishop then used a set of equations from previous research (Shang and Bishop (2000) [22]) to "to estimate the depths of detection, recognition, and impact for each combination of background and atmospheric conditions" [23].

The images used in that study equated to a turbine height (63 m [24]) of slightly over half that of the actual ones observed in the BLM study, and less than half the height of what are now commonly proposed.

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16 *BLM Study*, p. 40.

17 Sullivan, Robert G., et. al., "Offshore Wind Turbine Visibility and Visual Impact Threshold Distances", *Environmental Practice* 15(01):33-49, March 2013 [***Offshore Study***].

18 *Offshore Study*, p. 1.

19 *Offshore Study*, p. 11.

20 *Offshore Study*, p. 10.

21 *Offshore Study*, p. 1.

22 Shang, Haidong, and Ian D. Bishop, "Visual Thresholds for Detection, Recognition, and Visual Impact in Landscape Settings", *Journal of Environmental Psychology*, 2000, Vol 20, pp. 125-140.

23 Bishop, Ian D, 2002. "Determination of Thresholds of Visual Impact: The Case of Wind Turbines", *Environment and Planning B: Planning and Design* Vol. 29: pp. 714-715.

24 *University of Newcastle Study*, p. 13.

In addition, the BLM study of real wind farms indicated one of the inherent weaknesses in the Bishop research. The BLM study found that:

> "In the authors' judgment, based on the many observations for this study, and comparison of the corresponding photographs and narrative records from the observations, the photographs consistently under-represent the degree of visibility observed in the field. While true to some degree for all of the photographs, this is particularly true for photographs of the facilities taken from longer distances." [25]

Similar observations were made in the University of Newcastle study and the Offshore study.

So there is a consistent, empirically observed effect that assessments based on photographs tend to underestimate turbine visibility. Yet even with this limitation, the Bishop study concluded "In areas with completely transparent skies, visibility modelling out to 20 km – 30 km is justified, but effects beyond 20 km may be rare and depend on exceptional viewing conditions."[26], and this for turbines less than half or even one third the size now routinely approved.

Zone of Visual Influence (ZVI)

VI assessment guidelines from many jurisdictions and research use the term "zone of visual influence"[27] but generally don't specifically define it. However, the usage makes clear that they mean "the area within which the development (in this case, wind farm) ***may*** have some material visual impact and which therefore may need to be assessed".

Sometimes reference is made to a Zone of Theoretical Visibility (ZTV)[28], whose meaning is clear from the words. Commonly the ZVI distance is less than the ZTV, since it is reasonably understood that an object at the limit of visibility will, by definition, normally have negligible visual impact. For instance, the BLM study of wind farms with 120m turbines, stated[29] that "an appropriate radius for visual impact analyses would be 48 km", despite the fact that "The facilities were found to be visible to the unaided eye at >58 km (36 mi) under optimal viewing conditions".

Commonly, large parts of the area within a ZVI distance will have no view of the wind farm due to terrain or intervening structures. These can be readily and cheaply identified with available GIS software.

For all practical purposes, other parts will be locations where no one goes and will be fairly readily identified as such. That leaves wind farm proponents and planners with the residual ZVI where viewers are exposed to the wind farm to some degree and for which the proponent may be required to provide a justification for that impact (or delete particular turbines).

There are obviously arguments that might be advanced in justification. For instance:

- While the viewer can see some part of the wind farm, it is a sufficiently small part that at the distance of the viewer the visual impact is small; or

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[25] *BLM Study*, p.43.

[26] Bishop, Ian D, 2002. "Determination of Thresholds of Visual Impact: The Case of Wind Turbines", *Environment and Planning B: Planning and Design* Vol. 29: p. 718.

[27] *Evaluation of Methodologies for Visual Impact Assessments, NCHRP Report 741*, Transportation Research Board of the National Academies, Washington DC, 2013, pp. 32, 57.

[28] *Evaluation of Methodologies for Visual Impact Assessments, NCHRP Report 741*, Transportation Research Board of the National Academies, Washington DC, 2013, pp. 129, 135.

[29] *BLM Study,* p. 4.

- Given the position of the viewer, the wind farm, and the background against which it is seen, it is not prominent; or
- Given the nature of the landscape, adding the wind farm has little adverse impact on the view; or
- The frequency with which anyone is going to see the wind farm from that viewpoint is so low it can be basically ignored.

It is not suggested that comments such as the above are valid in any particular situation but they are arguments that might plausibly be made in some situations.

Note, it is also not suggested here that because a viewpoint will suffer a serious visual impact from a wind farm that the wind farm must be prevented. That is the point at which planning authorities are engaged in a merit assessment to determine what is, on balance, the best thing to do. Such decisions might include mandating changes to the wind farm configuration, or compensation to the affected parties, or some mitigation method, or deciding that the visual impact, as identified, should be accepted.

The purpose of VI assessment is to determine the extent of actual impact. What, if anything, should be done about it is a separate matter and should not affect the judgment. It is similar to the situation when you visit a doctor. There is a diagnosis phase and a treatment phase. Obviously the treatment phase is strongly informed by the diagnosis, but the reverse should not apply. The fact that treatment may be very expensive, or risky, or uncertain or anything else should play no part in actually diagnosing the extent of the problem.

Of course it is not unheard of for parties responsible for treatment (be it governments or private insurers) to attempt to influence diagnosis processes to reduce the likelihood of diagnoses that will be expensive for them. It would not be surprising in relation to wind farm policy to find parties with vested interests, be they government or wind farm developers, seeking to influence the diagnosis process to serve their interests.

What the empirical research established

Figure 1 shows a plot of ZVI thresholds for various turbine heights[30] indicated by multiple research studies[31], and a line of best fit (excluding the BLM study which suggested a ZVI well above the line). Based on their observations, Thomas and Sinclair proposed ZVIs of 15 kms for 50m turbines and 30 kms for 100m turbines. It can be seen that those ZVIs lie almost exactly on the line derived from other studies.

Figure 2 shows plots of thresholds for visual dominance and pre-eminence based on empirical research studies. It can be seen that:

[30] The available research data relates to turbine heights. While other aspects of turbines, such as tower width and swept area of the rotor blades may be important, that detail is not generally available across studies. In addition, there is a correlation between tip height and other dimensions. For structural reasons, higher towers are generally thicker. They are also typically used to support more powerful generators, which tend to require longer blades. The correlation between height and the other dimensions is not perfect but nonetheless turbine height turns out to be a powerful and consistent predictor of visibility.

[31] Note. Not all of the studies reviewed provided estimates for ZVI and for the two other thresholds examined. The graphs identify the studies in each plot.

- The threshold distances given in the Sinclair-Thomas matrix for the most intrusive band (A), which the matrix describes as "***Dominant impact*** *due to large scale, movement, proximity and number*" align very closely with what other research has identified as the visually dominant threshold.
- Similarly the threshold distances given in the Sinclair-Thomas matrix for the second most intrusive band (B), which the matrix describes as "***Major impact due to proximity: capable of dominating landscape***" align very closely with what other research has identified as the visual pre-eminence threshold.

Finally, it is obvious from both Figure 1 and Figure 2, that combined research leaves no doubt that there is a strong relationship between turbine height and the extent of visual impact at any particular distance from the turbines, which was the central point developed in the formulation of the Sinclair-Thomas matrix based on their empirical observations.

In addition, the graphs show that the threshold distances are essentially linearly related to height. Double turbine height and the threshold distance doubles, whether it is for ZVI, pre-eminence or visual dominance.

A threshold distance marks the point beyond which a particular level of impact is unlikely to occur. Within the threshold distance (say for visual dominance) not every viewpoint will experience that same level of impact. Factors specific to each viewpoint come into play, such as the number of turbines visible, turbine elevation relative to the viewpoint, and typical atmospheric conditions.

The important point is that within the threshold distance every viewpoint has the potential to experience the specified level of impact (e.g. visual dominance) unless other factors intervene to cause a lower level of impact.

Therefore for each viewpoint within the threshold, the relevant degree of VI cannot be assumed away. Its absence is a matter to be demonstrated in each instance, not assumed.

Table 2 shows some representative distances for the three thresholds (ZVI, Visual Pre-eminence, and Visual Dominance), for wind farms with turbines 100m and 150m high, based on the results plotted in Figures 1 and 2 for the studies reviewed. It also shows the approximate incremental increase in threshold distance for each extra 10m in turbine height.

Table 2
Threshold Distances (kms) for Turbine Height (m)

Threshold	**Turbine Height**		**Approx Distance per 10m of height**
	100m	150m	
ZVI	32	48	3.2
Visual Pre-eminence	13	19	1.3
Visual Dominance	5	8	0.5

While the multiple studies produce consistent ratios in determining threshold distances, there is a question as to the relevance of the various thresholds when evaluating VI.

ZVI appears to be used as a threshold beyond which there is unlikely to be any material VI from a wind farm. However, while it is less than the limit of visibility, several studies (e.g. BLM) indicate it as a substantial proportion of the ZTV (though note from Figure 1, that the BLM Study is an outlier, recommending a ZVI about 25% larger than derived from the other studies). It might

therefore be argued that ZVI (as specified in these studies) is an excessive distance to be used in evaluating wind farm VI.

At the other extreme is the *Visual Dominance* threshold. This is the threshold within which:

> The wind farm "dominated the view" (BLM Study and Offshore Study)
>
> There is "dominant impact due to large scale, movement, proximity and number" (Sinclair-Thomas)
>
> "turbines dominated the view" (Stevenson & Griffiths)

If a wind farm (or indeed any new industrial project) dominates the view, its visual impact, by definition, must be large. Whether a wind farm within the *Visual Dominance* threshold actually dominates the view is a factual matter to be determined. It may not do so in particular cases, for instance if obscured by the terrain. Nonetheless, the plain language of the relevant studies make clear that within this threshold distance there is likely to be a dominant impact unless some other factors mitigate it. So any VI assessment policy setting minimum distances for VI evaluation would include anything within the *Visual Dominance* threshold distance.

Figure 1

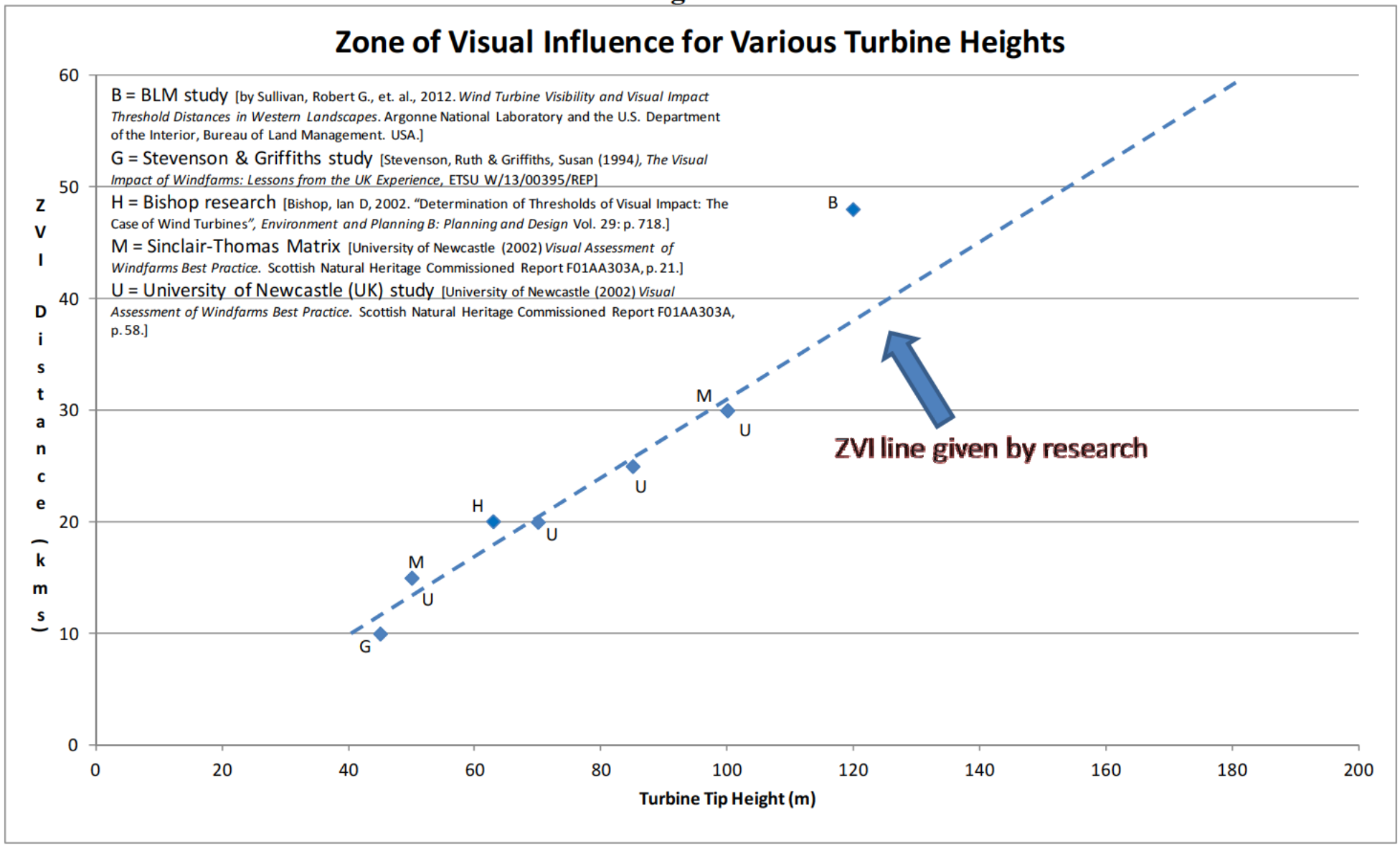
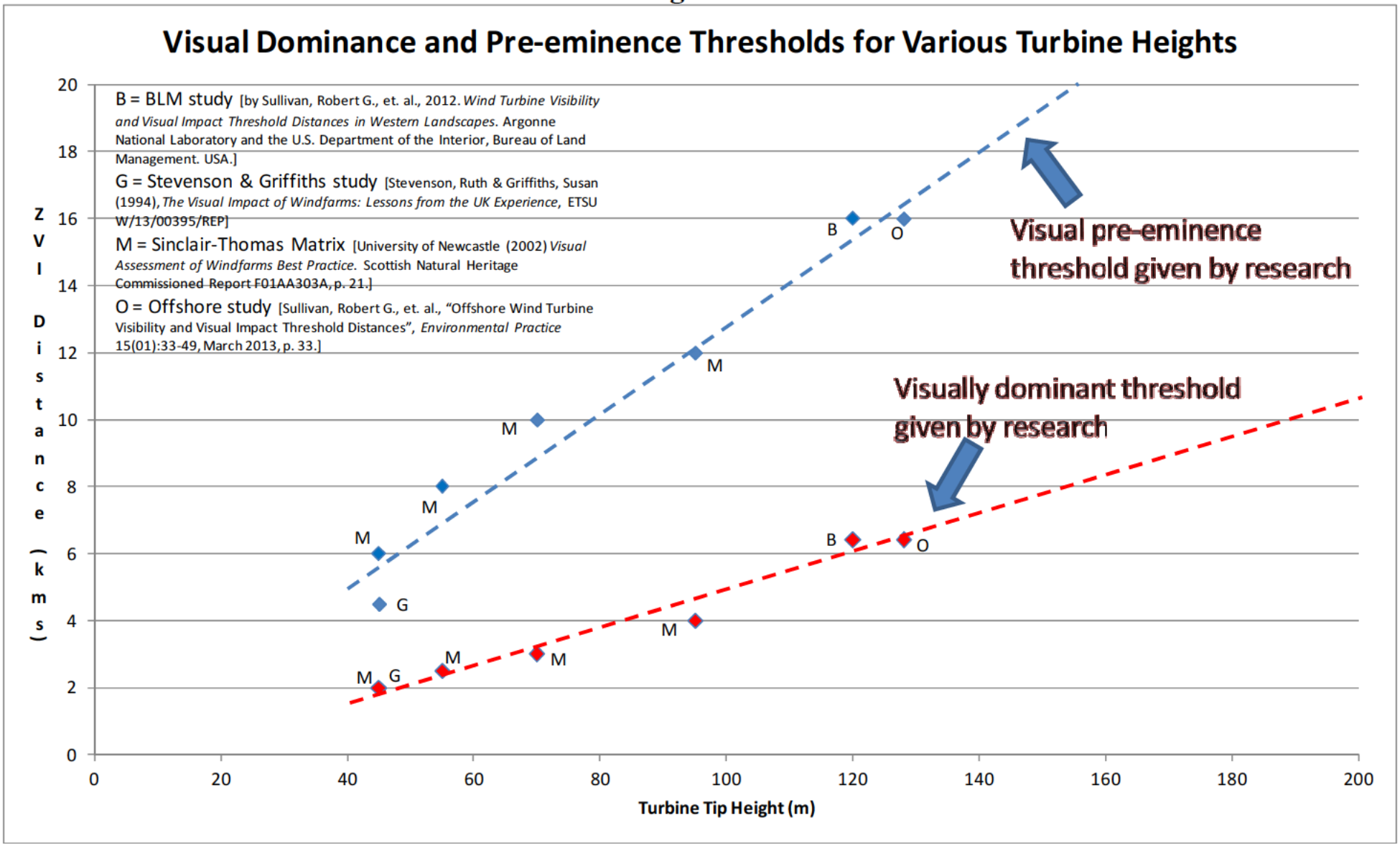

Zone of Visual Influence for Various Turbine Heights
B = BLM study [by Sullivan, Robert G., et. al., 2012. Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes. Argonne National Laboratory and the U.S. Department of the Interior, Bureau of Land Management. USA.]
G = Stevenson & Griffiths study [Stevenson, Ruth & Griffiths, Susan (1994), The Visual Impact of Windfarms: Lessons from the UK Experience, ETSU W/13/00395/REP]
H = Bishop research [Bishop, Ian D, 2002. "Determination of Thresholds of Visual Impact: The Case of Wind Turbines", Environment and Planning B: Planning and Design Vol. 29: p. 718.]
M = Sinclair-Thomas Matrix [University of Newcastle (2002) Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A, p. 21.]
U = University of Newcastle (UK) study [University of Newcastle (2002) Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A, p. 58.]
ZVI Distance (kms)
Turbine Tip Height (m)
ZVI line given by research
0
10
20
30
40
50
60
0
20
40
60
80
100
120
140
160
180
200
B
M
U
U
H
U
M
U
G

Figure 2


Visual Dominance and Pre-eminence Thresholds for Various Turbine Heights
B = BLM study [by Sullivan, Robert G., et. al., 2012. Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes. Argonne National Laboratory and the U.S. Department of the Interior, Bureau of Land Management. USA.]
G = Stevenson & Griffiths study [Stevenson, Ruth & Griffiths, Susan (1994), The Visual Impact of Windfarms: Lessons from the UK Experience, ETSU W/13/00395/REP]
M = Sinclair-Thomas Matrix [University of Newcastle (2002) Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A, p. 21.]
O = Offshore study [Sullivan, Robert G., et. al., "Offshore Wind Turbine Visibility and Visual Impact Threshold Distances", Environmental Practice 15(01):33-49, March 2013, p. 33.]
Visual pre-eminence threshold given by research
Visually dominant threshold given by research
ZVI Distance (kms)
Turbine Tip Height (m)
0
2
4
6
8
10
12
14
16
18
20
0
20
40
60
80
100
120
140
160
180
200

The next threshold is the one for *Visual Pre-eminence*:

> "At this distance, the wind facility is a major focus of visual attention, drawing and holding visual attention. . . . The facility as a whole is likely to be perceived by some viewers as having a large visual impact." (BLM Study and Offshore Study)
>
> "Major impact due to proximity: capable of dominating landscape" (Sinclair-Thomas)
>
> "Turbines appear visually intrusive" (Stevenson & Griffiths)

If a wind farm (or any development) is sufficiently prominent in the viewscape that it is "a major focus of visual attention . . . perceived by some viewers as having a large visual impact" or "capable of dominating (the) landscape" or "visually intrusive", then it surely has the potential to have a material visual impact for some observers. Whether that is the case for any particularly viewpoint within the threshold is a matter to be demonstrated rather than assumed away. Any policy to exclude consideration of visual impact on properties within the *Visual Pre-eminence* threshold, without specific evidence with respect to each property, would appear to be flouting the evidence from the empirical studies of wind farm visual prominence.

Other important empirical findings

In addition to elucidating the real relationship between turbine height and visual prominence, the empirical research has provided a number of other findings important to wind farm VI and the assessment of prospective VI:

- Blade movement increases the VI of turbines compared to a static structure of comparable dimensions.
- Because of the anomalous visual effect of blade movement from partially obscured wind turbines, their VI may be much greater than would be expected for the physical amount of turbine visible.
- Photographs and photomontages significantly and systematically underestimate the visibility of wind farms compared to field observations.
- Assessment frameworks using a 3x3 matrix are too simplistic to describe real world wind farm VI.

Blade movement

Most of the empirical studies on wind farm VI explicitly refer to the importance of blade movement in determining the visibility and VI of wind turbines and, by implication, the inadequacy of static images to represent VI. Thus the BLM study reported:

> "In the intermediate area, wind turbines would dominate the space because of their height and their movement. In the immediate area, wind turbines would be extremely dominant because of their size and the rotational movement of the blades (Jallouli and Moreau, 2009; University of Newcastle, 2002)."[32]
>
> "Additional research has been conducted to determine the influence of wind turbine blade movement in conjunction with distance. In general, the human eye can detect movement at large distances. The rotary and very regular movement of wind turbine blades is not a common type of "natural" movement,

[32] *BLM Study*, p. 11.

> especially at the scale of a large wind facility. Instead, this type of movement has been found to be highly noticeable" [33]
>
> "At times, the blades may not be visible, but a slight "pulse" in the intensity of light can be seen as the blade passes across the wind turbine tower (Coates Associates, 2007)." [34]
>
> "The prevalence of lower visibility ratings for observations where blades and blade movement were not visible, even at relatively short distances, suggests that blade/blade movement visibility may be an important driver of the overall visibility of wind facilities." [35]

The Offshore study reported:

> "As will be shown, the findings of our present study suggest that the actual distance for blade movement visibility is much greater than was indicated in these previous studies." [36]
>
> "The synchronized sweeping movement of the massive blades during the day and the synchronized flashing of the lighting at night contribute to the facilities' visibility over very long distances." [37]
>
> "Turbine blade movement was visible at distances as great as 42 km (26 mi) in 42 of the 49 daytime observations (Gunfleet Sands, Viewpoint V25, elevation 47 m) and was observed routinely at distances of 34 km (21 mi) or less. Contrary to expectations, lighting conditions, sun angle, and apparent contrast between the turbines and the sky backdrop did not substantially affect the likelihood of observing blade motion; blade motion was visible at distances beyond 30 km (19 mi) regardless of sun angle, lighting conditions, or contrast levels. Again, these distances are greater than those reported in previous studies." [38]

The University of Newcastle study reported:

> "The movement of the blades, in all cases where this is visible, increases the visual effect of the turbines because it tends to draw the eye." [39]
>
> "we judge that blade movement is perceptible to the casual observer at up to approximately 10 km." [40]
> ***Note. This observation was for turbines mainly around 65m to tip height.***

In addition, the University of Newcastle study reported:

> "The appearance of just the rotors, or the nacelle and rotors, above the horizon produces a disconcerting effect when they are moving that we would describe as less visually coherent" [41]

This last point is important because there is a tendency in VI assessments to discount the VI of turbines that are partly obscured from a viewpoint. The partly obscured turbine may appear to have less VI in a photo but the University of Newcastle study tells us it may not be less in the real world because of the perceptual impact of the anomalous movement when only part of the blade motion is visible.

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[33] *BLM Study*, p. 12.
[34] *BLM Study*, p. 13.
[35] *BLM Study*, p. 21.
[36] *Offshore Study*, p. 5.
[37] *Offshore Study*, p. 2.
[38] *Offshore Study*, p. 12.
[39] *University of Newcastle Study*, p. 52.
[40] *University of Newcastle Study*, p. 52.
[41] *University of Newcastle Study*, p. 52.

Systematic underestimation of VI using photographs and photomontages

Wind farm VI assessments generally depend on photomontages to display the purported visual scene after the wind farm is constructed. Consultants and planning officials then rely heavily on those images to make judgements about the magnitude of visual impact that will occur.

There are ways those images can be constructed to deliberately mislead. Scottish Natural Heritage has produced detailed advice[42] about how they should be produced in order to avoid artifactual distortions.

Importantly, the empirical research findings show that even if photomontages are prepared scrupulously, the result still systematically underestimates the VI compared to what will be experienced by someone looking at the real wind farm.

The University of Newcastle study reported:

> "We found that there was a general tendency to underestimate the magnitude of visibility in the ES descriptions compared to our judgements on site. This may be related to the frequent under-representation seen in photomontages" [43]

> "A photomontage can imply a degree of realism that may not be robust, and can seduce even a critical viewer into investing more faith in that realism than may be warranted. Certainly our case-study analyses confirm a widespread belief that photomontages almost always underestimate the true appearance of a windfarm from most viewpoints. This is in contrast to statements in some ESs that overestimation occurs because of the technique used to produce the photomontage." [44]

The BLM study report stated:

> "In the authors' judgment, based on the many observations for this study, and comparison of the corresponding photographs and narrative records from the observations, the photographs consistently under-represent the degree of visibility observed in the field. While true to some degree for all of the photographs, this is particularly true for photographs of the facilities taken from longer distances." [45]

and the Offshore study reported:

> "Our informal, qualitative opinion is that the photographs taken in the field generally show lower visual contrast levels than were actually observed during the visibility ratings. The photographs show lower contrast and less detail than was actually apparent in the naked-eye observations, and they do not capture the blade motion that attracted the visual attention of observers in the field." [46]

In the BLM and Offshore studies the researchers compared their own observation of the scenes with photographs they took at the time. In the University of Newcastle study the comparison was between the researchers' observation of the scenes and photomontages which had been prepared before the wind farms were built.

In all cases they concluded the photographs under-estimated the impact. Two factors in particular contributed. First, the photographs show lower contrast and less detail than was actually apparent in the naked-eye observations. Second, they lack motion, which, as the research showed, is a very important factor affecting the visibility of wind turbines. In addition the University of Newcastle

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[42] *Visual representation of windfarms: good practice guidance*, Scottish Natural Heritage, 2006 and *Visual Representation of Wind Farms, Version 2*, Scottish Natural Heritage, July 2014.
[43] *University of Newcastle Study*, p. 55.
[44] *University of Newcastle Study*, p. 60.
[45] *BLM Study*, p.43.
[46] *Offshore Study*, p. 45.

study pointed to some instances where the photomontage preparation was well short of best practice.

Given that the issue identified by these studies is systematic, planning authorities should consider photomontages with the knowledge that they almost invariably significantly under-state what will be the visibility and VI of the wind farm once constructed. That requires a conscious effort for planners to acknowledge this problem and explicitly view all photomontages, and assessments derived from them, on that basis.

Assessment methodology

Based on their empirical observations, the studies also made some comments highly relevant to VI assessments and how they are presented.

The University of Newcastle study reported:

> "The LI-IEA (1995) model matrix of three classes on each axis producing 9 cells, only 3 of which are typically judged as significant, is in our view simplistic and unrefined and quite unsuitable as a tool for widespread use. In particular it implies a degree of certainty about a very restricted definition of significance that we do not believe is justified. Expanding a 3 x 3 (9 cells) matrix to 4 x 4 (16 cells) or even 5 x 5 (25 cells) is much more representative of the diversity of size and sensitivity found in visual impact assessment." [47]

Note. The matrix referred to above has two dimensions, one magnitude of visual effect and the other for "sensitivity" to visual intrusion, for each of which a 3 point scale was used. This is a framework which, in some form or other, is frequently used in VI assessments. The University of Newcastle study explicitly found that the gradations possible with 3 point scales are inadequate to provide the granularity necessary to reasonably describe the range of situations they observed.

The BLM and Offshore studies both used a 6 point scale for visibility. The Sinclair-Thomas matrix is a 9 point scale. Stevenson & Griffiths used 4 categories for levels of visibility. The studies, and the explicit comments from the University of Newcastle study make clear that the 3 point scales and the 3x3 matrix often used in wind farm VI assessments are inadequate and therefore assessments presented using that methodology are misleading.

The University of Newcastle makes another important statement:

> "This may also be an appropriate point to raise a subtle presentational point about visibility assessment. Because many factors act to decrease or increase apparent magnitude (and therefore potential significance), there is a tendency in all the ESs examined (and in guidance such as is shown in Table 3) to adopt what might be termed the "half-empty" rather than the "half-full" approach to assessment. For example, guidance and assessment often emphasises the factors that decrease visibility ("only prominent in clear visibility") rather than the factors that increase visibility ("always prominent in clear visibility"). Although both statements are in one sense identical, a different adverb produces a different impression." [48]

In other words consultants' assessments are frequently written as advocacy not as impartial professional assessments and planning authorities need to identify wording that is meant to convey a skewed representation of the situation and discount it.

[47] *University of Newcastle Study*, p. 64.
[48] *University of Newcastle Study*, p. 55.

Wind farm size

There appears to be no demonstrable relationship, across the various studies, between wind farm size (number of turbines) and empirical VI. That is not surprising. Any effect due to number of turbines would surely be related to the number of turbines visible from a viewpoint, not the total number of turbines in the wind farm. The number of turbines visible at any viewpoint in the studies was often less than the whole wind farm, which is quite common.

However, some of the comments in the studies make clear that a large number of turbines is not necessary to create a strong VI. For instance, the Offshore study (with turbines averaging 128m) reported:

> "small to moderately sized facilities were visible to the unaided eye at distances greater than 42 km [26 miles (mi)]" [49]
>
> "At distances of 14 km (9 mi) or less, even isolated, small facilities will likely be a major focus of visual attention in seaward views, again in a variety of weather and lighting conditions." [50]

It is reasonable to suppose that the extent of VI is at least in part dependent on the number of turbines visible. It is also reasonable to expect a declining marginal impact from each additional turbine at a constant distance. In other words, if there are already 20 turbines in view, adding a twentyfirst will have much less ***additional*** impact than adding a second when otherwise only one turbine was in view. And the impact of a second turbine will generally be less than that of the first wind turbine in a view.

Naturally this is not suggesting the VI of 20 turbines will be less than that of a single turbine. The comment refers to the ***incremental*** impact of adding a single turbine, where that incremental VI will become less the more turbines are already present.

Summary

There is now a substantial body of empirical research by very credible teams on wind farm visual impact. That research shows a consistent and essentially linear relationship between turbine height, distance and wind farm visual prominence. For any degree of visual prominence (such as the zone of visual influence, or threshold for visual dominance), if turbine height is doubled, the distance threshold point for that degree of impact also basically doubles.

The research has also revealed several other points important for wind farm visual impact assessment.

- Blade movement significantly increases the visual impact of turbines compared to a static structure of comparable dimensions.
- Photographs and photomontages materially underestimate the visibility of wind farms compared to field observations of actual wind farms. This is due to both the absence of movement, which is so important in drawing attention, and the fact that the photographic process inherently does not fully reflect human perception of a scene.

[49] *Offshore Study*, p. 1.
[50] *Offshore Study*, p. 14..

- Because of the anomalous visual effect of blade movement from partially obscured wind turbines, their visual impact may be much greater than would be expected for the physical amount of turbine visible.
- Assessment frameworks using a 3x3 matrix to represent visual impact, which are common in wind farm assessments, are too simplistic to capture real world wind farm visual impact and thus misleading.

Visual impact assessment for wind farm planning decisions is highly likely to be invalid and systematically biased to the disadvantage of those who may suffer wind farm visual impact, if the assessment methodologies are not fully grounded in and consistent with the results of the empirical research that has been conducted on wind farm visual impact.