Australian Labor Party Senators' Dissenting Report

1.1 Australia's wind energy industry remains small in comparison both with its potential size and with the total size of wind energy installed around the world. However, to date it has played a vital role in abating the greenhouse gas emissions of Australia's electricity generation sector and has contributed the majority of new generation capacity under the Renewable Energy Target (RET) scheme.

1.2 The explosion of wind energy production around the world and Australia's relatively small participation in this growth to date was well summarised in evidence given before the committee:

> Wind energy has had one of the most sustained and rapid growth rates of any industry on the planet. According to the Global Wind Energy Council, 15 years ago there were only 13,000 megawatts of wind energy installed world wide. That is about three times what we have installed here, in Australia, now. Three years later, wind generation doubled. Three years later, it doubled again. Three years later, it doubled—again. Three years later it doubled yet again. And three years later the exponential growth finally slowed down to only 50 per cent, partly due to the GFC. This is phenomenal success, by any measure. I challenge you to think of another good or service that has had such a long-running and rapid growth rate.
>
> Last year the entire electrical generational capacity of Australia's national electricity market was matched around the world by the building of new wind farms. And how is Australia doing? We have installed just a bit over one per cent of the world's wind turbines. In fact, 14 countries have more wind energy installed than Australia. Five countries have over five times as much wind energy installed than we do, even though we have one of the largest—and windiest—countries on the planet. Australia is not in any way, shape or form the proving ground for wind energy. Wind farms have been operating for decades overseas and the industry has been extremely successful.[1]

1.3 Far from being a pioneer of an experimental and possibly dangerous new technology, Australia has to date adopted a relatively limited amount of what is a very well-established method of electricity generation around the world. Furthermore, the Australian wind energy industry has successfully worked within some of strictest planning controls found anywhere in the world.

1.4 Australia's largest electricity generator, AGL, has stated that three-quarters of Australia's thermal plant is at the end of its useful life[2] and has committed to closing its own coal plants by 2050. In this context, it is undeniable that Australia must

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1 Mr Jonathan Upson, *Committee Hansard*, 19 May 2015, p. 67.

2 Nelson, T., Reid, C., and McNeill, J., *Energy only markets and renewable energy targets: complementary policy or policy collision?*, AGL Applied Economic and Policy Research Working Paper No. 43, August 2014, p. 15. http://aglblog.com.au/wpcontent/uploads/2014/08/No-43-energy-only-and-renewable-targets-FINAL.pdf, (accessed 14 June 2014)

develop public policy that will encourage the development of low-cost, renewable energy sources to replace outdated thermal plants.

1.5 The benefits of wind energy generation in terms of greenhouse gas abatement are well established, as are the minimal impacts wind farms have on their local environment. The integration of wind energy into electricity grids has been successfully managed around the world and Australia has been no exception in this regard. Furthermore, the wind energy industry has provided a much-needed source of employment and income in regional communities.

1.6 Labor Senators are disappointed that recognition of the levelised costs of different energy sources was absent from the majority report. We note that it is well-established that wind farms have among the lowest levelised cost of any form of new electricity generation capacity, whether it be renewable or non-renewable.

1.7 The Clean Energy Council commissioned an independent study on wind farm investment, jobs and carbon abatement from consultants SKM in 2012. SKM looked at existing wind farm financial data and interviewed companies with experience in numerous wind farm projects. The report presents a breakdown of investment during the construction and operations phases of a major wind farm, collated from actual data provided by developers, contractors, advisers and consultants.[3]

1.8 The report found that for every 50 megawatts of capacity, a wind farm:

- has an estimated average construction workforce of 48 people with each worker spending $25,000 per year in the local area, equating to some $1.2 million per year flowing into hotels, shops, restaurants, and other local service providers.
- employs around five staff for operations and maintenance, equating to an ongoing local annual influx of $125,000;
- provides up to $250,000 annually in payments to farmers, a proportion of which flows into the local community; and
- provides a community contribution of up to $80,000 per year for the life of the project.[4]

1.9 With this background in mind, Labor Senators reiterate their strong support for the wind energy industry in Australia. The Australian Labor Party has recently announced a strengthened commitment to renewable energy generation in Australia by stating its intention that 50 per cent of Australia's large scale electricity production come from renewable sources by 2030. As it currently provides the lowest cost renewable energy source, the wind energy industry will play a large role in meeting this target.

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3 Clean Energy Council, *Wind farm investment, employment and carbon abatement in Australia*, July 2012, available at: http://www.cleanenergycouncil.org.au/technologies/wind-energy.html.

4 Clean Energy Council, 'Wind Energy', http://www.cleanenergycouncil.org.au/technologies/wind-energy.html, accessed 30 July 2015.

1.10 Labor Senators believe this inquiry has been prevented from arriving at a balanced view of the wind industry by several factors.

1.11 First, the terms of reference for the inquiry exclude from consideration the specific environmental benefits provided by wind energy generation and the broader imperative of reducing the carbon intensity of the world's energy production in order to mitigate the impact of climate change. The terms of reference also exclude any comparison of wind energy generation with the impacts of other forms of energy generation on human health, the local environment and climate change. In short, the terms of reference have been framed so as to avoid consideration of the primary issues that must be addressed by public policy regarding Australia's energy generation mix.

1.12 Second, the terms of reference focus on a series of topics that have been repeatedly raised by opponents of wind energy generation and found to be without substance in numerous previous inquiries and reviews. Thus, the purported health impacts of wind farms have again featured most prominently in this inquiry and all expert testimony provided to the committee has again found such claims to be without foundation, as has occurred in numerous previous inquiries. There simply is no evidence of any causal link between the operations of wind turbines and human health impacts.

1.13 This pattern has been repeated with regard to the following baseless theories that:

- wind farms do not provide any greenhouse gas abatement;
- the energy consumption of wind turbine manufacturing outweighs their lifetime energy production;
- wind farms have led, via the RET scheme, to significant cost imposts on electricity consumers;
- wind farms have an intolerable impact on the local bird and bat populations;
- wind farms present a significant fire risk and hamper the work of firefighters; and
- wind farms present a significant threat to aviation operations.

1.14 As discussed in detail under each term of reference, Labor Senators believe evidence presented to the inquiry convincingly refutes each of these claims.

Response to majority report recommendations

1.15 It is pleasing to note that the majority report states that:

> The committee acknowledges the need for Australia's renewable energy sector to develop and prosper. It also recognises that a properly regulated wind industry should be an important part of the sector's future growth.[5]

5 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p.4

1.16 However, Labor Senators are extremely concerned that the recommendations put forward in the majority report stand in direct contrast to this statement. If enacted, they would threaten Australia's ability to secure a low-cost, clean energy mix into the future by making future wind farm investment unviable.

1.17 For this reason, Labor Senators strongly disagree with most of the recommendations and findings of the committee majority.

1.18 Labor Senators were particularly disappointed that members of the committee majority have chosen to discount the overwhelming evidence from government bodies, both state and federal, academics, health experts, acousticians and economists in order to recommend new and onerous regulations in the interim report.

1.19 The willingness of the Government to adopt these recommendations, even before the committee provided its final report, must be seen in the light of other recent actions it has taken to hamper the expansion of renewable energy generation in Australia, including the repeal of an effective carbon pricing regime, the reduction of the RET and directing the Clean Energy Finance Corporation (CEFC) not to invest in wind and solar generation projects.

1.20 In light of the fact that there is no credible scientific evidence to causally link wind turbines with human health impacts, Labor Senators strongly oppose recommendations put forward by members of the committee majority that appear to rely on such discredited claims.

1.21 Labor Senators note that the Clean Energy Council provided a strong response to an article published in the *Australian* which outlined leaked recommendations from the majority report. This response gives a clear indication of the damage that the these recommendations would do to future investment:

> Adopting these reckless recommendations would damage Australia's international investment reputation, right when we are finalising major agreements with some of our biggest trading partners," Mr Thornton said. Business needs stability and confidence to invest, and this has only recently been restored to the renewable energy sector after 18 months of uncertainty.
>
> Hundreds of millions of dollars' worth of projects have been announced since a deal on the Renewable Energy Target was legislated, and these will create hundreds of jobs and major investment in regional and rural areas of the country.
>
> Adopting the headline recommendation of this report would be economically reckless, and shows some of the senators are out of touch with the business community and the Australian people, who overwhelmingly support renewable energy.[6]

1.22 Labor Senators concur with the assessment of the Clean Energy Council.

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6 Clean Energy Council, Media release, 'Senate Inquiry Blows it on Wind power', 31 July 2015, http://www.cleanenergycouncil.org.au/media-centre/media-releases/July-2015/senate-inquiry-blows-it-on-wind-power.html , accessed 3 August 2015.

1.23 Labor Senators believe the regulatory regime, and associated research, that would be imposed by the majority recommendations would be enormously expensive, duplicative and unworkable.

1.24 Proposals to significantly alter the distribution of responsibilities between the Federal Government and the states and territories with regard to land use planning and environment protection are also not supported by evidence gathered by the committee. No systemic problems with the planning, monitoring and compliance regimes governing wind farms have been identified during this inquiry. Furthermore, no evidence was produced that would warrant the Commonwealth imposing onerous bureaucratic measures on a single industry to the exclusion of other comparable industries.

1.25 Thus, Labor Senators do not support the proposal to establish a 'National Wind Farm Ombudsman' or 'Wind Farm Commissioner'. This proposal should not be proceeded with. It would constitute a misuse of resources by replicating existing complaint-handling mechanisms in each state and territory and would be a considerable administrative burden for the wind energy industry.

1.26 Labor Senators also do not support the creation of an 'Independent Expert Scientific Committee on Industrial Sound', nor the imposition of a levy to fund such a body. As detailed in discussion under term of reference (c), the National Health and Medical Research Council (NHMRC) already provides advice on this topic and has acted professionally with regard to its evaluation of the scientific evidence in this area.

1.27 The attempt to establish a parallel scientific advisory body is simply a means to sidestep the findings of the NHMRC, which are inconvenient for those who wish to assert such a link between human health effects and wind farms. Labor Senators believe this dismissive attitude to scientific evidence and to the work of the NHMRC represents a highly irresponsible approach to setting public health protection measures.

1.28 Labor Senators do not support the establishment of a 'National Environment Protection (Wind Turbine Infrasound and Low Frequency Noise) Measure'. The committee has been presented with no scientific evidence to support the claim that infrasound at the sound pressure levels generated by wind turbines is harmful to human health. Evidence provided to the committee suggests that there is no precedent anywhere in the world for using infrasound as part of a noise regulation regime for wind farms.

1.29 Labor Senators strongly disagree with any recommendation that undermines the bipartisan agreement made in 2015 regarding the Renewable Energy Target. We are particularly concerned with the concept of using the Emissions Reductions Fund as a substitute mechanism for supporting renewables projects.

1.30 The renewables industry has been in limbo for 18 months as a result of the government’s failure to keep its election promise that there would be no changes to the Renewable Energy Target. Investment has just started again after bipartisan agreement was reached on a 33,000 GWh target by 2020. Proposing further

amendments at this point in time is extremely short-sighted and will be seriously damaging to investor confidence.

1.31 This recommendation would not only see the death of renewables investment in Australia, along with thousands of jobs in regional communities, but it would put a massive impost on the Federal Budget, as the Emissions Reductions Fund is a direct taxpayer-funded subsidy.

1.32 This recommendation fundamentally misunderstands the intent of the renewable energy target, which has the dual goals of reducing carbon emissions and providing a catalyst for the transition of Australia towards a future low-carbon energy mix.

1.33 The Emissions Reduction Fund is an inefficient, expensive waste of taxpayers' money that will not achieve meaningful emissions reductions.

1.34 In contrast, the government's own Renewable Energy Target review concurred with the majority of modelling that the Renewable Energy Target will actually lead to lower electricity bills for consumers from 2020. This is discussed in detail in Section (a).

1.35 To switch renewable energy support from an efficient market mechanism to an inefficient taxpayer-funded subsidy would be both expensive and destructive.

1.36 Labor Senators note that this recommendation also seeks to misrepresent the realities of life-cycle emissions from wind farms. The majority report has ignored the advice of turbine manufacturers and government agencies that wind turbines generally repay the costs of energy expended within three to seven months of operation, as discussed in detail under term of reference (h).

1.37 The recommendation also falsely implicates renewable energy in the levels of back up energy generation in Australia. It is unfortunate that the majority report privileges the opinion of Alan Moran over the advice of the national grid operator, the Australian Energy Market Operator, which has refuted claims that the introduction of greater levels of wind has required an increase in capacity dedicated to maintaining the stability of the grid. This is also discussed in detail under term of reference (h).

1.38 Labor Senators are also concerned by the fallback recommendation to make Renewable Energy Certificates expire in five years. This would make wind farm investment completely unviable and almost certainly guarantee that no new wind energy would be installed in Australia. We also hold concerns that this recommendation would push up electricity prices for consumers by removing the downward pressure on wholesale prices provided by renewable generation supported by the RET.

1.39 Labor Senators believe the recommendation to compel State Governments to comply with National Wind Farm Guidelines and the NEPM by linking compliance to the issuance of Renewable Energy Certificates is extremely heavy-handed and shows little understanding of the distinction between state and federal planning responsibilities.

1.40 Labor also notes the suggestion that there should be 'general compliance' with National Wind Farm Guidelines, but 'specific compliance' with the NEPM without providing any definition as to what constitutes 'general' or 'specific' in this context.

Labor Senators do not support the recommendation for the Productivity Commission to undertake research into the impact of wind power electricity generation on retail electricity prices. This recommendation would constitute a misuse of resources as the government's own Renewable Energy Target Review and independent modelling has found that renewable energy puts downward pressure on wholesale electricity prices and the RET leads to lower electricity prices for consumers. This is discussed in detail in Section (a).

1.41 Labor Senators note that the majority report recommendation for a performance audit of the Clean Energy Regulator fundamentally misunderstands the mandate and duties of this body and seeks inquiry into areas that are completely outside the remit of the CER. The CER's remit and performance is discussed in detail in Section (b).

1.42 Labor Senators are highly doubtful that the states will decide to participate in the onerous regime proposed in the report and believe the recommendation of a federal takeover in the event of non-cooperation is completely inappropriate and unrealistic and would present a massive cost burden to the Federal Budget.

Dissenting report recommendations

Recommendation 1

1.43 **Labor Senators recommend that the Federal Government not proceed with the recommendations made to it in the majority report.**

1.44 **Labor Senators further recommend that the Federal Government reassure the wind energy industry, which is both an important source of income and employment in rural areas and a vital means of abating Australia's greenhouse gas emissions, that it is not intent on preventing its further development based on unsubstantiated claims of negative health, environment and economic impacts.**

Recommendation 2

1.45 **Labor Senators recommend that the Federal Government publicly acknowledge that:**

- **wind farms are an important means of reducing greenhouse gas emissions from Australia's electricity sector, thereby contributing to our greenhouse gas emissions reduction goals;**
- **the health impacts of fossil fuel extraction and generation are acknowledged by the medical and scientific community;**
- **there are no causal links between wind turbines and impacts on human health;**

- **the wind industry is a growing industry at a time when Australia's manufacturing sector is undergoing significant change and downsizing and that it provides valuable employment opportunities in regional Australia; and**

- **the continued growth of the renewable energy industry, including wind, is a positive thing for Australia's economy and its environment.**

1.46 Although no systemic failings with the current regime governing wind farm developments were identified in the inquiry, Labor Senators believe that discussion on the following topics highlighted some areas where improvements can be made.

1.47 As discussed in detail under term of reference (d), the committee received evidence that the distribution of planning, monitoring and compliance responsibilities between state and local governments is a point of tension. Specifically, some local government bodies explained that the complex and technical nature of wind farm planning approvals and compliance work are beyond their expertise and resourcing.

1.48 Labor Senators note that several states have moved to centralise planning approvals for wind farms at the state level to address this problem. While this may lessen the burden that falls on local governments, the task of conducting compliance work will still require significant resourcing.

1.49 While noting that the best distribution of resources and responsibilities is a matter for determination by each state jurisdiction, Labor Senators believe local governments should be sufficiently resourced to effectively meet their responsibilities.

Recommendation 3

1.50 **Labor Senators recommend that state governments ensure that local governments are adequately resourced to undertake their monitoring and compliance roles under state planning laws.**

1.51 As also discussed under term of reference (d), Labor Senators note that the Clean Energy Council has developed, with the support of a range of wind energy companies, the *Community Engagement Guidelines for the Australian Wind Industry*. This document was developed by the Australian Centre for Corporate Social Responsibility and, given the vital role effective community engagement plays in successful wind farm developments, Labor Senators believe the best-practice recommendations it contains could be given a more formal status.

Recommendation 4

1.52 **Labor Senators recommend that state and territory governments consider the codification of community engagement guidelines based on the Clean Energy Council's *Community Engagement Guidelines for the Australian Wind Industry* to ensure a greater level of community confidence and input is generated by wind farm planning, construction and operation.**

1.53 As discussed under term of reference (e), Labor Senators note that post-construction noise monitoring is generally conducted by acoustic consultants retained by wind farm developers. Labor Senators do not question the professionalism of these acoustic consultants and believe evidence provided to the committee supports

the view that this arrangement has not affected their independence or the nature of their advice.

1.54 However, Labor Senators believe that the community's perception of independence might be enhanced if this arrangement were reformed to implement an 'arm's length' relationship with developers.

Recommendation 5

1.55 **Labor Senators recommend that state and territory government consider reforming the current system whereby wind farm developers directly retain acoustic consultants to provide advice on post-construction compliance.**

(a) the effect on household power prices, particularly households which receive no benefit from rooftop solar panels, and the merits of consumer subsidies for operators

1.56 Before addressing the effect of the RET scheme on household power prices, Labor Senators emphasise that, contrary to repeated assertions made during the inquiry, the scheme does not involve any taxpayer subsidy of renewable power generation. The scheme does not impose any costs on the federal budget beyond the administrative costs of the Clean Energy Regulator (CER).

1.57 As explained by the CER, the RET scheme works by creating a market for renewable energy certificates which must be purchased and surrendered by electricity retailers, not by funding from the federal budget:

> The Renewable Energy Target works by allowing both large-scale power stations and the owners of small-scale systems to create certificates for every megawatt hour of power they generate. Certificates are then purchased by electricity retailers who sell the electricity to householders and businesses. These electricity retailers also have legal obligations under the Renewable Energy Target to surrender certificates to the Clean Energy Regulator, in percentages set by regulation each year. This creates a market which provides financial incentives to both large-scale renewable energy power stations and the owners of small-scale renewable energy systems.[7]

1.58 The Chief Executive Officer of the CER, Ms Chloe Munro, emphasised this point when she appeared before the committee:

> There is no taxpayer funding of the renewable energy targets. The way that it operates is that certificates are created on the one hand and purchased and surrendered on the other hand entirely within the electricity market. So the payment for those certificates is made essentially by electricity retailers[8]

1.59 This is not a tax and does not involve a subsidy from the federal government to clean energy generators. As discussed further below, while the cost of the scheme is passed on to consumers by electricity retailers, this direct cost is offset by the downward pressure on wholesale prices that is also a result of the scheme.

1.60 When evaluating the impact of wind generation on household electricity prices, it is important to note that the expansion of renewable generation capacity under the RET affects power prices in two opposing ways. The overall effect on household electricity prices depends on which of these two opposed effects are stronger. These price pressures are described briefly below.

1.61 As explained by the Department of the Environment, wind power, once installed, has lower operating costs than fossil fuel competitors because it can operate

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7 Clean Energy Regulator, 'About the Renewable Energy Target', http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target, accessed 22 July 2015.

8 Ms Chloe Munro, *Committee Hansard*, 19 May 2015, p. 7.

at around zero marginal cost—that is, it does not have any ongoing fuel costs. As a result:

> Wind farms are able to bid their capacity into the National Electricity Market at relatively low prices to ensure their generation is dispatched. By displacing gas or coal generation, wind power places downward pressure on wholesale electricity prices in the short to medium term. To the extent these lower prices are passed on to homes and businesses through competitive tension, wind power can lead to lower power costs for consumers.
>
> To the extent that the policy initiatives stimulate an excess of new wind generation beyond that required by the market, the downward pressure on wholesale prices can be amplified.[9]

1.62 The countervailing price effect arises from the RET and other cross-subsidy schemes, which aim to overcome the fact that wind farms have relatively high capital costs such that they are not yet commercially viable without support. The RET 'enables new renewable energy projects, including wind farms, to earn additional revenue through the creation and sale of tradeable certificates for renewable generation. The Renewable Energy Target Rules oblige electricity retailers to purchase and surrender these certificates, the costs of which are passed on to electricity users.'[10]

1.63 As calculated by the Australian Energy Market Commission, the cost of the RET cross subsidy has been estimated to make up a small proportion of retail electricity bills at approximately four per cent.[11] As wind makes up approximately half of renewable generation under the RET, it follows that the cross subsidy specifically directed to wind power makes up approximately two per cent of household bills.[12] This impact is, however, offset by the impact of increasing renewable generation on wholesale prices.

1.64 To determine the impact of downward pressure on wholesale electricity prices, modelling has been undertaken by a number of organisations. The majority of this modelling concurs that, in the long term, the downward pressure on wholesale electricity prices will outweigh the increased costs from the RET cross subsidy, leaving consumers better off than they would be in the absence of the RET.

1.65 Modelling undertaken by ACIL Allen for the recent Warburton Review, which was undertaken prior to the recent reduction of the RET, confirmed this conclusion. The Department of the Environment summarised their findings as follows:

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9 Department of the Environment, *Submission 358*, p. 1.

10 Department of the Environment, *Submission 358*, p. 1.

11 Australian Electricity Market Commission, *Final report: 2014 residential electricity price trends*, December 2014, p. 179, http://www.aemc.gov.au/getattachment/ae5d0665-7300-4a0d-b3b2-bd42d82cf737/2014-Residential-Electricity-Price-Trends-report.aspx, accessed 17 July 2015.

12 Department of the Environment, *Submission 358*, p. 1.

> …the ACIL Allen modelling indicates that while the currently legislated Renewable Energy Target would cumulatively add around $250 in net present value terms to average household electricity bills over the period 2015 to 2020, this cumulative impact would fall virtually to zero by 2030 as the downward pressure on wholesale electricity prices comes to outweigh the certificate cost impost after 2020.[13]

1.66 While the cumulative cost over the five years between 2015 and 2020 has been estimated at $250, the Climate Institute has noted that this amounts to an impost of approximately $1 per week for the average household and, as noted above, lower wholesale prices are projected to offset this amount by 2020.[14]

1.67 Labor Senators therefore emphasise that the RET has delivered a substantial boost in renewable energy generation in Australia, with attendant greenhouse gas emissions abatement, without a significant increase in retail costs over the longer term.[15]

1.68 Labor Senators also note that recent modelling by a variety of firms has also found that removing or substantially reducing the RET would cost more money than it saves.[16] One example of such modelling is that developed by Schneider Electric for their client group of large energy consumers. Schneider Electric informed the committee that their research suggested the Large-scale Renewable Energy Target (LRET) would have three benefits:

> Firstly, we found that the LRET would act as a hedge against increasing natural gas prices. The LRET directly influences the generation mix and, by reducing the reliance on gas-fired generation, the LRET reduces the sensitivity of the electricity markets to gas prices. The LRET therefore acts as a hedge against rising gas prices, which are expected to increase in the long term, due to linkage of the Australian east coast gas market to the global markets via the exporting of LNG and growing global and domestic gas demand. Secondly, we found that the LRET acted as a hedge against carbon emissions, and may keep carbon emissions lower in the longer term. By reducing carbon emissions, the LRET reduces exposure to the market—and our customers—to carbon costs, acting as a potential hedge against rising taxes or permit prices into the future. In addition, the low-emission volumes under the RET may also help keep carbon prices lower.
>
> Finally, and most importantly for our customers, we found the impact of the LRET was on the long-term wholesale price. The LRET is forecast to result in a generation mix with lower marginal cost, lower carbon emissions and

13 Department of the Environment, *Submission 358*, p. 2.

14 The Climate Institute, 'Would reducing the Renewable Energy Target significantly lower power bills?', March 2014, http://www.climateinstitute.org.au/verve/_resources/TCI_ReducingRET_ImpactOnBills_FactCheck.pdf, accessed 30 July 2015.

15 The Australia Institute, *Submission 67*, p. 1; for information on abatement levels achieved by the RET, see discussion below under term of reference (h).

16 For a summary of this modelling see Clean Energy Council, *Submission 450*, p. 5.

> increased competition in the wholesale electricity market, all which serve to reduce prices. The scenarios investigated under the RET in its current form result in lower wholesale electricity prices than the scenarios of a reduced version of the RET or the repeal of the RET.[17]

1.69 The Clean Energy Council submitted the following estimated costs to households of the abolition of the RET:

> Analysis by the CEC using the results of the Review Panel's modelling has shown that by early 2020 the average household power bill would be an estimated $35 a year higher if the target is repealed compared to leaving it unchanged. By 2030 prices are expected to be more than $70 a year higher under a Repeal scenario on average.[18]

1.70 The committee was presented with evidence from Frontier Economics, stating that its modelling of the RET had found that the downward pressure on wholesale prices may not in fact be sufficient to fully counteract the direct cost to consumers:

> Our modelling has tended to show that that target would lead to higher retail prices than the reduced target. Our submission pointed to that acknowledgement from another economic consulting firm, Roam Consulting, which said that this merit order effect or the suppressing of wholesale prices is likely to be transient and models may overstate this effect.[19]

1.71 Labor Senators note that this finding is contradicted by modelling undertaken by a number of other organisations, as discussed above, and that conclusions as to the balance of these price effects is highly dependent on assumptions. In this regard, Labor Senators note criticisms that have been made in the past about assumptions used by Frontier Economics in its modelling, particularly with regard to the cost of renewable generation projects, the cost of fossil fuels for other forms of generation, and the ability of industry to meet the RET.[20]

1.72 In light of these findings, Labor Senators believe there is no case for the further reduction or abolition of the RET based on its impact on household power prices.

1.73 Labor Senators emphasise that the recent reduction of the RET to 33,000 GWh by 2020, brought about by the passage of the Renewable Energy (Electricity) Amendment Bill 2015 on 23 June 2015, was agreed to with great reluctance by the Labor Party. Prior to this compromise being reached, the uncertainty over the future of RET had effectively halted new investment in the industry and placed at risk its future viability, a situation which the Labor Party could not allow to continue.

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17 Mr Brian Morris, *Committee Hansard*, 29 June 2015, p. 22.

18 Clean Energy Council, *Submission 450*, p. 6.

19 Mr Matt Harris, *Committee Hansard*, 19 May 2015, p. 19.

20 See, for example, Giles Parkinson, 'Modelling wars: moulding data to kill renewables', *Renew Economy*, 20 June 2015, http://reneweconomy.com.au/2014/modelling-wars-mould-data-kill-renewables-82732, accessed 22 July 2015.

1.74 At the time this compromise position was reached, the Labor Party made it clear that it viewed this reduced target as a floor on which to build, rather than a ceiling. It has since announced its support for a more ambitious target of sourcing at least 50 per cent of Australia's large scale generation from renewables by 2030.[21]

1.75 Labor Senators note evidence from the CER that it has accredited 440 power stations under the LRET and that this includes 82 wind farms with a combined installed capacity of around 4,100 MW.[22] The recent growth in wind generation means that it now accounts for 60 per cent of Large-scale Generation Certificates (LGCs) created by power stations annually.[23]

1.76 Wind accounts for the majority of LGCs currently produced because 'the levelised cost of energy from wind is cheaper than other renewable sources.'[24]

1.77 The 2012 *Australian Energy Technology Assessment* report of the Bureau of Resources and Energy Economics, Australian Energy Technology Assessment table over the page shows that wind is a cheaper source of energy than coal and renewables such as solar and geothermal.

Table 1—Levelised costs of energy in 2012 Australian dollars

	AETA (A$/MWh)	**AETA (excl CO^2 price) (A$/MWh)**	**International Energy Agency (A$/MWh)**
Black coal	176–189	125	109
Black coal with CCS	193–253	183–243	110
Supercritical pulverised black coal	135–145	84–94	103
Combined cycle gas turbine	96–108	81–93	97
Combined cycle gas turbine with carbon capture and storage	142–166	137–161	122
Solar thermal	330–402	330–402	380
PV – non tracking	212–264	212–264	391
Wind—onshore	111–122	111–122	83
Geothermal	150–163	150–163	55
Nuclear (Gen3+)	94–99	94–99	91

Source: Bureau of Resources and Energy Economics, *Australian Energy Technology Assessment*, 2012, p. 96.

21 Mark Kenny, 'Bill Shorten to unveil 50% renewable energy target at Labor conference', *Canberra Times*, 22 July 2015, http://www.canberratimes.com.au/federal-politics/political-news/bill-shorten-to-unveil-50-renewable-energy-target-at-labor-conference-20150721-gih4bp.html, accessed 22 July 2015.

22 Clean Energy Regulator, *Submission 93*, p. 6.

23 Clean Energy Regulator, *Submission 93*, p. 7; see graph on this page for comparison with number of LGCs generated by other renewable sources.

24 The Australia Institute, *Submission 67*, p. 1.

1.78 The Bureau of Resources and Energy Economics estimates that by 2030, solar photovoltaic and wind are expected to have the lowest LCOE of all of the evaluated technologies.

1.79 Wind-generated, onshore electrical power has low long-term marginal power generation costs because:

- the fuel source is renewable, sustainable and free, but the resource itself is area-specific, and also variable;
- the power generation does not produce polluting gases and emissions, which need to be mitigated and/or incorporated into the full costs of electricity generation; and
- it has no water usage.[25]

1.80 The Australian Energy Market Operator (AEMO) also provided the committee with tables comparing the levelised cost of generation options for renewable and non-renewable technologies (Table 2). These figures illustrate that wind power remains the most competitive form of renewable generation and with solar being the second most competitive.[26]

Table 2—LCOE across renewables technologies

Technology	Fuel type	Max Capacity factor (%)	2014		2015	
			CO_2 emissions ($kgCO_2$-e/MWh)	Minimum LCOE ($/MWh sent out)	CO_2 emissions ($kgCO_2$-e/MWh)	Minimum LCOE ($/MWh sent out)
Wind (100 MW)	Wind	43	-	99	-	99
Biomass	Biomass	70	23	100	23	119
Solar PV (FFP)	Solar	21	-	224	-	149
Solar PV (SAT)	Solar	21			-	183
Solar PV (DAT)	Solar	21			-	240
Solar thermal (CR with storage)	Solar	42	-	277	-	218
Solar thermal (CLF)	Solar	23	-	328	-	284
Solar thermal (PT with storage)	Solar	42	-	302	-	294
Wave[157]	Oceanic	60			-	147
Geothermal - HAS	Geothermal	83	-	137		
Geothermal - EGS	Geothermal	83	-	137		

Source: Australian Energy Market Operator, *South Australian Fuel and Technology Report*, 2015, p. 46. See also AEMO, *Submission 469*.

1.81 Suggestions were put forward during the committee's inquiry that a proportion of LGCs ought to be reserved for particular technologies, such as solar. Labor Senators do not agree with such proposals as reserving a proportion of the LGCs for

25 Parliamentary Library, *Brief to the Select Committee on Wind Turbines*, received 10 February 2015.

26 Australian Energy Market Operator, *Submission* 469, pp 7–8.

renewable technologies with higher levelised costs will reduce the efficiency of the RET in terms its cost per unit of greenhouse gas abatement. Furthermore, the costs of various forms of renewable generation are changing as technology advances, and the RET should remain technology neutral so as to allow the most efficient forms of investment to take place.

1.82 Labor Senators note that the Government has recently demonstrated a similar determination to direct investment to less commercially viable forms of generation by apparently ordering the CEFC not to invest in wind generation projects or in household and small-scale solar projects.[27] These directives come after an earlier directive to the CEFC to generate a significantly higher investment return over the medium term without increasing its level of portfolio risk. The Chair of the CEFC stated in response to this directive:

> Within the narrow field of investment allowable under the CEFC Act, achieving such increased returns without increasing risk, is highly challenging, and in my experience, outside the scope of normal market opportunities. In this respect, the 2015 Investment Mandate requires the CEFC to seek out additional investments that are outside market norms, in addition to carrying on its existing investment activities.[28]

1.83 These events highlight the Government's disregard for commercial realities of investment in renewable energy generation and its intention to stymie the CEFC in its mandated task of facilitating financing for clean energy projects. Labor Senators emphasise that the CEFC has been highly successful to date and, far from imposing a burden on the federal budget, has delivered a rate of return on its investments of 3.5 per cent above the benchmark return of the Government five-year bond rate.[29]

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27 Heath Aston, 'Government directive against wind farm investments surprises CEFC, crossbenchers', *Sydney Morning Herald*, 12 July 2015, http://www.smh.com.au/federal-politics/political-news/government-directive-against-wind-farm-investments-surprises-cefc-crossbenchers-20150712-giagiy.html, accessed 22 July 2015; Heath Aston, 'Government pulls the plug on household solar', *Sydney Morning Herald*, 13 July 2015, http://www.smh.com.au/federal-politics/political-news/government-pulls-the-plug-on-household-solar-20150712-gian0u.html, accessed 22 July 2015.

28 Clean Energy Finance Corporation, 'CEFC responds to the new investment mandate', 5 March 2015, http://www.cleanenergyfinancecorp.com.au/media/107304/cefc_chairs_response_to_treasurer_and_minister_for_finance_re_2015_cefc_investment_mandate.pdf , accessed 22 July 2015.

29 Clean Energy Finance Corporation, 'Investments', http://www.cleanenergyfinancecorp.com.au/investments.aspx, accessed 22 July 2015.

(b) how effective the Clean Energy Regulator is in performing its legislative responsibilities and whether there is a need to broaden those responsibilities

1.84 Any judgements regarding the effectiveness of the CER must be based on a sound understanding of its mandate. Labor Senators note that the committee received a number of submissions that questioned the effectiveness of the CER, but in most cases these submissions appeared confused about its responsibilities.

1.85 The CER is an independent statutory authority established by the *Clean Energy Regulator Act 2011*. It administers a number of clean energy schemes, but it is the RET scheme, more specifically the LRET component, that is relevant to this inquiry. The RET is administered in accordance with the *Renewable Energy (Electricity) Act 2000*.

1.86 As summarised by the Department of the Environment, the responsibilities of the CER in relation to wind farms are limited to 'managing the tradable certificate markets established under the scheme legislation', which includes the following activities:

> Accrediting eligible renewable energy power stations under the Renewable Energy Target scheme;
>
> Managing the online Renewable Energy Certificate Registry (including the issue, transfer and surrender of certificates);
>
> Maintaining registers of accredited power stations, large-scale generation certificates and applications for accredited power stations: and
>
> Monitoring and enforcing compliance by certificate market participants with the Renewable Energy Act and regulations.[30]

1.87 It is important to note that the CER is not responsible for:

> matters relating to wind farm siting (planning and approval processes) and operation (including health and safety impacts) of wind farms. Under Australia's constitutional arrangements, these matters are properly the responsibility of the states and territories. The Regulator is required to take account of compliance with the relevant laws of the states and territories.[31]

1.88 The CER noted in its submission that the RET has been the subject of three reviews in the last four years, twice by the Climate Change Authority in 2012 and 2014, and most recently in the Warburton RET Review.[32] The Warburton review commented specifically on the administration of the RET by the CER, but did not adopt any suggestions for improvements:

> The Panel has investigated opportunities to reduce administration and compliance costs of the RET scheme while allowing it to meet its

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30 Department of the Environment, *Submission 358*, p. 4.

31 Department of the Environment, *Submission 358*, p. 4.

32 Clean Energy Regulator, *Submission 93*, p. 2.

> objectives. The majority of the submissions to the review indicate satisfaction with the administration of the scheme with only a few proposals for improving administrative arrangements.[33]

1.89 With regard to these reviews, the Department of the Environment also commented that:

> …none these has included findings that would cast doubt on the Regulator's effectiveness in performing its legislative responsibilities or recommendations to broaden the Regulator's responsibilities in relation to wind farms. In relation to the latter, steps in that direction could run the risk of exceeding the Commonwealth's constitutional jurisdiction, duplicating state and territory regulations and creating additional costs for business that are difficult to justify.[34]

1.90 The division of responsibilities between the states and territories and the Commonwealth with regard to regulation of wind farms is discussed further under terms of reference (d) and (e).

1.91 The role of the CER in accrediting power stations to participate in the LRET attracted considerable comment during the inquiry. The CER emphasised that the accreditation process is only for the purpose of allowing participation in the LRET, not for the purpose of 'certifying that the relevant power station has met State or Territory environmental, planning or work health and safety approvals and requirements.'[35]

1.92 LRET accreditation is dependent on the power station generating some or all of its power from an eligible energy source and on the power station meeting the following prescribed requirements set out in subregulation 4(1) of the *Renewable Energy (Electricity) Regulations 2001*:

> (b) a power station that is in the national electricity market must use NEM standard metering; and
>
> (c) a power station that is not in the national electricity market must use metering that enables the Regulator to determine the amount of electricity generated by the power station; and
>
> (d) the power station must be operated in accordance with any relevant Commonwealth, State, Territory or local government planning and approval requirements.[36]

1.93 Some witnesses suggested that the CER has failed to act on evidence that power stations are breaching the requirement that power stations 'must be operated in

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33 Dick Warburton, Brian Fisher, Shirley In't Veld, Matt Zema, *Renewable Energy Target Scheme: report of the Expert Panel*, 15 August 2014, p. 114.

34 Department of the Environment, *Submission 358*, pp 4–5.

35 Clean Energy Regulator, *Submission 93*, p. 4.

36 *Renewable Energy (Electricity) Regulations 2001*, https://www.comlaw.gov.au/Details/F2015C00555 , accessed 16 July 2015.

accordance with any relevant Commonwealth, State, Territory or local government planning and approval requirements'.

1.94 The CER explained that it requires power stations to regularly declare that they are in compliance with all laws and it also follows up with state, territory or local authorities when it becomes aware of suggestions that power stations are not in compliance.[37]

1.95 However, the CER cannot act to suspend the accreditation of a power station merely on the suspicion that it is not meeting requirements under state and territory law. It is not an appropriate body to adjudicate on whether a power station meets state or territory planning requirements. Rather, it must wait for objective evidence that such a breach is occurring, which would generally be a state or territory planning body or court making a definitive finding to that effect.[38]

1.96 The CER's General Counsel, Mr Purvis-Smith, noted that the power to suspend the accreditation of a power station under the LRET had not been exercised to date. He explained that this is because definitive findings had not been arrived at by state and territory authorities:

> The process works. The difficulty is that we rely on that objective evidence. In doing that, we rely on the states and territories to a large degree to form a view as to whether a contravention has occurred. It is state based law. These are approvals that have been put in place by state and local authorities. Of course, we are going to listen to what they have to say. We have not been in the situation where a state or territory has made a definitive finding that there has been a breach of their local laws. There has been conjecture but no-one, to my knowledge, has ever moved to a final declaration finding, court proceeding, to say there has been a contravention of the law.
>
> We do not necessarily have to wait for the states and territories to find a contravention. If there was an admission of a breach, that would be sufficient. It is not a closed inquiry, in that sense. We are open to other avenues of finding out that information.[39]

1.97 Labor Senators believe that, with regard to its administration of the LRET, the CER has effectively fulfilled its legislated responsibilities to date. Suggestions that the CER has failed to properly address concerns about the planning compliance of certain wind farms are founded on the mistaken belief that the CER is in a position to override or prejudge planning determinations at the state and territory and local government levels.

1.98 Labor Senators do not agree with suggestions raised during the inquiry that the remit of the CER should be increased such that it would have a direct role in evaluating the compliance of power stations with state and territory regulations or in monitoring the sound levels of power stations.

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37 Mr Geoff Purvis-Smith, *Committee Hansard*, 19 May 2015, p. 2.

38 Mr Geoff Purvis-Smith, *Committee Hansard*, 19 May 2015, p. 2.

39 Mr Geoff Purvis-Smith, *Committee Hansard*, 19 May 2015, pp. 2-3.

1.99 The CER, which is an economic regulator with a very specific mandate, does not possess the expertise to properly address such matters. Even if it were possible to acquire such expertise, a highly undesirable situation would emerge in which the CER would be attempting to determine compliance with state and territory based planning laws in parallel with state and territory planning bodies or, alternatively, attempting to determine compliance with an as yet non-existent Commonwealth planning regime governing wind farms.

1.100 Labor Senators therefore do not believe there is any justification for broadening the remit of the CER in an attempt to address perceived failings of state and territory based planning regimes. State and territory planning decisions governing all types of development are inevitably subject to controversy from time to time. No case has been made as to why wind farm developments require the specific intervention of the Commonwealth.

1.101 This position is consistent with that of the CER itself:

> It is the respectful submission of the Regulator that its responsibilities do not need to be broadened. The Clean Energy Regulator is an economic regulator, charged with the responsibility of ensuring that the RET scheme is administered appropriately. The Clean Energy Regulator does not have, and should not have, responsibility for matters that are currently within the remit of the relevant State or Territory authorities (for example planning approvals, work health and safety obligations and environmental protection).[40]

1.102 Finally, Labor Senators note that many submissions that were critical of the performance of the CER focussed on the claim that LGCs have been invalidly issued because greenhouse gas emissions reductions are not in proportion to the amount of renewable electricity generated by certified power stations. These criticisms are also founded on a misconception of the RET as LGCs are issued on the basis of eligible electricity generated, not on the basis of emissions reductions. This matter is discussed further below under term of reference (h).[41]

40 Clean Energy Regulator, *Submission 93*, p. 16.

41 Clean Energy Regulator, *Submission 93 – supplementary submission*, pp. 1-2.

(c) the role and capacity of the National Health and Medical Research Council in providing guidance to state and territory authorities

1.103 Labor Senators note that the committee received a number of submissions and also took evidence at public hearings from people who attribute a wide variety of health symptoms to the operation of wind farms and put forward a number of mechanisms by which these effects are supposed to have been induced, including by exposure to infrasound.[42] Labor Senators do not question that these submitters and witnesses have experienced such symptoms. However, Labor Senators also emphasise that the suggestion that these symptoms have been directly caused by wind farms is entirely without scientific basis. No credible evidence has been presented to this inquiry to establish such a direct causal link.

1.104 Labor Senators note that the committee majority report states:

> …it would seem that the NMHRC's assessment of the lack of consistent evidence coexists with significant empirical, biological and anecdotal evidence that many people living nearby wind turbines suffer similar symptoms and identify the wind turbines as the cause for their symptoms.[43]

1.105 Labor Senators do not accept this characterisation of the evidence put before the committee. While the committee heard a large amount of anecdotal evidence regarding the supposed health impacts of wind turbines, it did not in fact receive any empirical or biological evidence to this effect.

1.106 Labor Senators emphasise that the confusion of anecdote with reliable empirical evidence is characteristic of the irresponsible approach taken by majority senators in this inquiry.

1.107 The NHMRC is 'Australia's leading body for supporting health and medical research, developing evidence-based health advice, and setting standards in ethics in health care and research, within a single national organisation.'[44] In the opinion of Labor Senators, it is the appropriate body to assess and report on the evidence regarding health effects of wind farms.

1.108 The NHMRC is established as an independent statutory body under the *National Health and Medical Research Council Act 1992* and comprises the CEO, the council, and its principle committees. The council is itself made up of state and territory chief health or medical officers, the Chief Medical Officer of the Australian Government and a range of health and medical research experts.[45]

1.109 Under section 7(1)(a) of this act, the NHMRC is required to inquire into, issue guidelines on, and advise the community on matters relating to:

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42 For a list of such submissions, see footnote 2 at Senate Select Committee on Wind Turbines, *Interim Report*, June 2015, p. 3.

43 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 11, p. 34.

44 National Health and Medical Research Council, *Submission 102*, p. 1.

45 National Health and Medical Research Council, *Submission 102*, p. 1; p. 4.

(i) the improvement of health; and

(ii) the prevention, diagnosis and treatment of disease; and

(iii) the provision of health care; and

(iv) public health research and medical research; and

(v) ethical issues relating to health;

1.110 Under section 7(1)(b), the NHMRC is also required to advise and make recommendations to the Commonwealth, states and territories on these matters.

1.111 The NHMRC's activities are guided by the priorities identified in the *NHMRC Strategic Plan 2013–2015*. Its recent work on wind farms and human health has taken place under priority area 8 in this plan, which identifies, among other matters, 'emerging community concerns about the health impacts of new technologies' as a matter requiring an 'evidence-based approach.'[46]

1.112 The NHMRC first addressed the issue of wind farms and human health in 2009 by conducting a rapid review of published scientific literature to determine whether existing evidence supported concerns regarding infrasound, noise, electromagnetic energy, shadow flicker and blade glint. This work culminated in a 2010 public statement which concluded that 'there is currently no consistent evidence that wind farms cause adverse effects in humans.'[47]

1.113 The NHMRC continued to monitor evidence in this area, and hosted a scientific forum in June 2011, which included 'state and territory health, planning and environment authorities and other key stakeholders, including environmental health experts and researchers, acoustic engineers, public interest groups involved with wind farms in Australia and international experts from countries with substantial experience in wind turbines.' After consideration of the results of this forum, the NHMRC commenced a systematic literature review focused on the possible health impacts of audible noise and infrasound. The findings of this systematic review have been used to develop a statement and information paper. As with its earlier rapid review, the information paper finalised in 2014 concludes that 'there is currently no consistent evidence that wind farms cause adverse health effects in humans.'[48]

1.114 The NHMRC advised the committee that the following steps were taken to ensure evidence was appropriately identified, assessed and summarised in this process:

- Establishment of the Wind Farms and Human Health Reference Group under Section 39 of the Act from 1 February 2012 to 31 January 2015
- Appointment of two observers to the Reference Group

46 National Health and Medical Research Council, *Submission 102—Attachment 1*, p. 8.

47 National Health and Medical Research Council, *Submission 102*, p. 5.

48 National Health and Medical Research Council, *Submission 102*, pp. 5–6.

- Disclosure of any interests by Reference Group members and observers (published on the NHMRC website).
- An independent systematic review of evidence up to October 2012
- Independent methodological review of the systematic review of evidence.
- Public consultation on the draft Information paper for period of 45 days from February 2014 (providing 36 submissions).
- Review of draft Information Paper by six expert reviewers.
- An independent review of additional evidence up to May 2014, including additional references submitted during public consultation and expert review.[49]

1.115 In examining evidence produced to date on the health effects of wind farms the NHMRC's expert reference group established there 'were only a small number of poor quality papers that directly examined the health outcomes of wind farm emissions.'[50] As such, the NHMRC announced a targeted call for research into wind farms and human health on 24 March, which closed on 6 May 2015 after receiving four applications. The NHMRC outlined the intention of this call for further research:

> There are obvious limitations in existing direct evidence on wind farms and human health outcomes, and, in funding the TCR, NHMRC intends to stimulate the research required to build a robust body of evidence to establish whether there are adverse health effects from exposure to wind turbine emissions. Up to $2.5 million over five years is available for this work and outcomes of the TCR are expected to be announced in December this year. However, NHMRC will only fund high quality research which will provide answers to some of the difficult issues that have been raised by the review.[51]

1.116 Dr Elizabeth Hanna, a member of the NHMRC Wind Farm and Human Health Reference Group, informed the committee that, in her opinion, sufficient evidence had already been gathered for the health and scientific communities to decide that there was no direct link between wind farms and health problems. She commented as follows on a recent Health Canada study, which came to the conclusion that there is no association between exposure to wind turbine noise and any self-reported illnesses:

> I would argue that it has reached the satisfaction level, particularly, when you incorporate the Health Canada study, which actually did use world's best practice and which did go through a very rigorous methodology to be able to identify—it was large, it accurately measured noise. Again, it goes back to the key things of research. If you want to show causation—and this is the core issue here: is it the wind farm that is actually causing real and

49 National Health and Medical Research Council, *Submission 102*, pp. 5–6.

50 Ms Samantha Robertson, *Committee Hansard*, 19 June 2015, p. 15.

51 Ms Samantha Robertson, *Committee Hansard*, 19 June 2015, p. 15.

> genuine health problems?—then you have to go back to the basic tenets. You have to show that exposure to a hazard exists. You have to show that there are actual, real and genuine health harms. We have to show a dose response, such that if there is no exposure there is no health problem. If there is exposure, health problems do exist. Then the dose response is a factor—you increase the exposure and you increase the health issues.[52]

1.117 In response to the suggestion that no amount of research will be sufficient to address the concerns of those opposed to wind farm development, Professor Chapman commented:

> I agree that it is impossible to prove a negative. However there are many research questions where such lack of proof does not continue to stimulate serious research into the as yet unproven phenomenon…We have repeatedly seen anti-wind farm interests reject any findings that do not accord with their beliefs. The rejection by such interests of the recent large scale Health Canada study is a prime example of this. The manifest opposition to wind farms of a majority of this Committee is a sad chapter in the erosion of evidence-based attempts at policy making in Australia.[53]

1.118 Labor Senators reject the criticisms outlined in the majority report of the NHMRCs process and methodology.

1.119 Labor Senators fully support the work of the NHMRC and believe it is the appropriate body to assess the evidence relating to the health effects of wind farms and to coordinate further research, should that be deemed worthwhile. The process conducted to date has been open, transparent and in accord with its established procedures. Labor Senators note that the NHMRC is currently assessing proposals submitted in response to its call for further research on this matter.

1.120 In light of the NHMRC's engagement with the issue and the nature of its findings, Labor Senators strongly disagree with proposals put forward in the committee's interim report to establish an alternative source of advice on human health.

1.121 Labor Senators also strongly oppose further recommendations that flow from this proposal in the committee's report, including that a new *National Environment Protection (Wind Turbine Infrasound and Low Frequency Sound) Measure* be established by the National Environment Protection Council based on advice from this proposed new scientific body.

1.122 These recommendations simply assume, contrary to the available scientific evidence, that wind turbines do directly cause harm to human health.

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52 Dr Elizabeth Hanna, *Committee Hansard*, 19 June 2015, p. 20; Health Canada, 'Wind Turbine Noise and Health Study: Summary of Results', http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php, accessed 24 June 2015.

53 Professor Simon Chapman, Answers to questions on notice arising from 29 June public hearing.

Experts advise there is no evidence that wind farms harm human health

1.123 The committee was informed that the NHMRC's position is in keeping with that of other peak scientific and medical bodies around the world. A representative of Infigen Energy, Mr Jonathan Upson, noted:

> I am not aware of any government, scientific, medical or regulatory organisation in the world that has come to the conclusion that wind turbines have a detrimental impact on health.[54]

1.124 Indeed, not only has no medical or scientific peak body come to such a conclusion, it appears that 'wind turbine syndrome' has never been written up in any indexed medical journal in the world. Professor Simon Chapman made this point, among a series of others, in his appearance before the committee:

> Why have there been no case series or even single case studies of so-called wind turbine syndrome published in any reputable medical journal? Why has no medical practitioner come forward with a submission to any committee in Australia about having diagnosed disease caused by a wind farm? Where in the world is there even a single example of an accredited acoustics, medical or environmental association which has given any credence to direct harmful effects of wind farms? Why has no complainant anywhere in the world ever succeeded in a common-law suit for negligence against a wind farm operator if this is a real phenomenon?[55]

1.125 Labor Senators note that the majority report made claims about court proceedings against wind farms. However, it failed to provide evidence that the court cases it listed resulted in damages due to human health impacts resulting from wind farm operations[56].

1.126 The conclusions arrived at by the NHMRC have been endorsed by or agree with the positions of other relevant peak bodies, including the Australian Medical Association (AMA). The AMA issued a statement on wind farms in 2014 outlining its position:

> The available Australian and international evidence does not support the view that the infrasound or low frequency sound generated by wind farms, as they are currently regulated in Australia, causes adverse health effects on populations residing in their vicinity. The infrasound and low frequency sound generated by modern wind farms in Australia is well below the level where known health effects occur, and there is no accepted physiological mechanism where sub-audible infrasound could cause health effects.[57]

1.127 Labor Senators respect the decision of the AMA not to participate in the inquiry. Labor Senators also accept that the AMAs position statement is evidence-

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54 Mr Jonathan Upson, *Committee Hansard*, 19 May 2015, p. 68.

55 Professor Simon Chapman, *Committee Hansard*, 29 June 2015, pp 28–29.

56 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p.22.

57 Australian Medical Association, *AMA position statement – wind farms and health 2014*, p. 1, https://ama.com.au/position-statement/wind-farms-and-health-2014, accessed 23 July 2015.

based, clear and unequivocal. We reject the assertion in the majority report that 'It has been left to wind farm companies to confirm the AMA's current position'.[58]

1.128 The PHAA expressed a similar position to the AMA in its submission to the inquiry:

> 1. Health impacts of wind turbines, including “Wind Turbine Syndrome” and “Vibroacoustic Disease” have been raised as concerns in the media and some of the literature, but these collections of symptoms are not recognised medical conditions.
> 2. Despite some limitations to the availability of relevant studies, many reviews of the literature have failed to identify evidence that infrasound (that is low frequency sound, in the range less than [20 Hz]) has adverse effects on health at the levels produced by modern wind turbines. Symptoms which people claim are consequent to wind turbine exposure, may be common in the community and may sometimes be attributed to psycho-social factors. In general, a relative minority of those exposed to wind turbines report being affected, and annoyance is higher in those who are unhappy about the presence of wind turbines.
> 3. A review of over 60 scientific review articles on wind turbine noise and health states that "based on the findings and scientific merit of the available studies, the weight of evidence suggests that when sited properly, wind turbines are not related to adverse health".[59]

1.129 Associate Professor Simon Carlile of the University of Sydney told the committee:

> I would like to start out by saying that as a neuroscientist, I know of no good neuroscientific evidence that wind turbines are harmful to human health. I also believe that wind turbines will play an indispensable part in our energy solutions for the future.[60]

1.130 The Climate and Health Alliance, which represents 28 health sector organisations, addressed the issue of wind turbine infrasound, which some individuals believe leads to human health impacts:

> The available Australian and international evidence does not support the view that the infrasound or low frequency sound generated by wind farms causes adverse health effects for people living or working in proximity to them.
>
> …
>
> At distances beyond 500 metres, infrasound and low frequency sound generated by wind farms in Australia is thought to be below the level

58 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 24.

59 Public Health Association of Australia, *Submission 276—Attachment 1*, p. 2.

60 Associate Professor Simon Carlile, *Committee Hansard*, 29 June 2015, p. 69.

> capable of causing health effects to occur, and there is no accepted physiological mechanism where subaudible infrasound from wind farms could cause health effects.[61]

1.131 The Australian Association of Acoustical Consultants has published a position statement which confirms there is no evidence that infrasound from wind farms is causally related to any human health impacts.

> Infrasound (frequencies below 20Hz for the purpose of this statement) is generated by both natural sources (such as people, wind, waves, thunder and earthquakes) and mechanical sources (such as fossil fuel power generation, travelling in a car with windows open, traffic, industry, air conditioners, aircraft and wind turbines). Investigations have found that infrasound levels around wind farms are no higher than levels measured at other locations where people live, work and sleep. Those investigations conclude that infrasound levels adjacent to wind farms are below the threshold of perception and below currently accepted limits set for infrasound.[62]

1.132 Labor Senators note with concern that the majority report has implied that the World Health Organization (WHO) has found the operations of wind turbines are causally linked to adverse health effects, including cardiovascular disease and cancer.[63]. This stands in direct contrast to statements made by the WHO in a background briefing paper:

> The increased use of renewable energy, especially wind, solar and photovoltaic energy, will have positive health benefits, some of which have been estimated.
>
> …
>
> The ExternE Project considered wind energy to have the lowest level of impacts (health and environmental), of all the fuel cycles considered.[64]

Research findings

1.133 Labor Senators absolutely respect the testimony of individuals who claim their health has been impacted by exposure to wind farms and do not doubt that some individuals are legitimately experiencing symptoms. We do, however, recognise that there is no evidence of a causal link between the activities of wind turbines and any physical complaints and are particularly concerned that genuine medical concerns could be going undiagnosed as individuals mistakenly attribute legitimate symptoms to the operation of wind turbines.

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61 Climate and Health Alliance *Submission 331*, pp 5–6.

62 Association of Australian Acoustical Consultants, Position Statement on Wind Farms, *Supplementary Submission 194*.

63 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p.17.

64 World Health Organization, *Energy, sustainable development and health. Background document for the Fourth Ministerial Conference on Environment and Health*, 23-25 June 2004, Geneva. p. 85; p. 100.

1.134 Many submitters to the inquiry recognised the great contribution of the Health Canada 'Wind Turbine Noise and Health Study' to the body of knowledge on the potential impacts of wind farms on human health. This $2.1 million epidemiological study, conducted in conjunction with Statistics Canada is the largest of its kind yet conducted. It incorporated a random sample of over 1,200 houses at varying distances from wind turbines at six different wind farms, 4,000 hours of acoustic data, acoustic and medical expertise, self-reported health questionnaires and objective health measures including hair cortisol, blood pressure and heart rates.[65]

1.135 Health Canada released preliminary research findings in November 2014. Notably, they failed to find any link between wind turbine noise (WTN) exposure and health impacts:

> 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.
>
> *While some individuals reported some of the health conditions above, the prevalence was not found to change in relation to WTN levels.*[66]

1.136 Health Canada did recognise, however, that 'annoyance toward several wind turbine features (ie. Noise, shadow flicker, blinking lights, vibrations and visual impacts)' were 'statistically associated with increasing levels of WTN'.[67]

1.137 Dr Elizabeth Hanna expressed the view that annoyance towards wind farms is likely to be a very relevant factor in reported health symptoms:

> The weight of evidence that I reviewed during my term on the wind farm panel has led me to believe that there is indeed no evidence that wind farms cause health problems. Also, I think it is very unlikely that there are direct health effects. The pathway that I believe is most likely is through annoyance, and this can generate health symptoms as reported, and these are very, very real. So at no stage do we discredit the view of people that report health symptoms, that they are not real in themselves. But the evidence is such that, when you are of the mindset that you are against a wind farm, or indeed exposure to anything else, such as RSI—which was

65 Health Canada, 'Wind Turbine Noise and Health Study', http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php, accessed 3 August 2015.

66 Health Canada, 'Wind Turbine Noise and Health Study: Summary of Results', http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php, accessed at 3 August 2015.

67 Health Canada, 'Wind Turbine Noise and Health Study: Summary of Results', http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php, accessed 3 August 2015.

> 'kangaroo paw' years ago, from repetitive strain injury—again, it was shown that, if people had a negative attitude, they were the ones that had a much higher rate of showing symptoms. This has been shown in several research papers…[68]

1.138 Health Canada's findings concur with an analysis of Public Benefit Scheme prescription data undertaken by the Head of Medicine at Adelaide University, Professor Gary Wittert. *Four Corners* has reported that this study found no evidence that people living near wind farms were taking more medication.[69]

1.139 Labor Senators note that 'Wind turbine syndrome' has been credited with causing an impossibly wide range of symptoms, which further reduces its plausibility.

1.140 Professor Simon Chapman has compiled a list of symptoms, diseases and aberrant behaviours, currently including 244 entries, attributed to wind turbine exposure.[70]

1.141 Labor Senators also note that Professor Chapman has compiled an up to date list of 25 reviews of the research literature relevant to the wind farms and health effects, all of which support the conclusion that there is currently no evidence that wind farms directly cause health problems.[71]

1.142 Labor Senators also draw attention to a study undertaken by Professor Chapman that examined the historical and geographical variations in complaints regarding noise or health effects from wind farms in Australia. The results of this study are as follows:

> There are large historical and geographical variations in wind farm complaints. 33/51 (64.7%) of Australian wind farms including 18/34 (52.9%) with turbine size >1 MW have never been subject to noise or health complaints. These 33 farms have an estimated 21,633 residents within 5 km and have operated complaint-free for a cumulative 267 years. Western Australia and Tasmania have seen no complaints. 129 individuals across Australia (1 in 254 residents) appear to have ever complained, with 94 (73%) being residents near 6 wind farms targeted by anti wind farm groups. The large majority 116/129(90%) of complainants made their first

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68 Dr Elizabeth Hanna, *Committee Hansard*, 19 June 2015, p. 16.

69 ABC News online, 'Research challenges wind farm illness link', 25 July 2011, http://www.abc.net.au/news/2011-07-25/research-challenges-wind-farm-illness-link/2808824, accessed 3 August 2015.

70 Professor Simon Chapman, *Symptoms, Diseases and Aberrant Behaviours Attributed to Wind Turbine Exposure*, updated 8 Jan 2015, http://ses.library.usyd.edu.au/handle/2123/10501, accessed 28 July 2015. For a discussion of this array of symptoms, see Professor Simon Chapman, ' Wind turbine disease: a classic 'communicated' disease', *The Conversation*, 20 July 2012, https://theconversation.com/wind-turbine-syndrome-a-classic-communicated-disease-8318, accessed 28 July 2015.

71 Professor Simon Chapman and Teresa Simonetti, *Summary of main conclusions reached in 25 reviews of the research literature on wind farms and health*, updated 10 April 2015, http://ses.library.usyd.edu.au//bitstream/2123/10559/7/WindHealthReviews_3.pdf, accessed 28 July 2015.

> complaint after 2009 when anti wind farm groups began to add health concerns to their wider opposition. In the preceding years, health or noise complaints were rare despite large and small-turbine wind farms having operated for many years.[72]

1.143 Labor Senators are disappointed that the majority report has attempted to discredit Professor Chapman's eminent professional qualifications, which he outlined for the committee:

> I am Professor of Public Health, University of Sydney. I have a PhD in medicine and I am a fellow of the Academy of the Social Sciences in Australia. I have 500 publications in peer-reviewed journals which have been cited over 9,600 times. My Order of Australia was for distinguished service to medical research, particularly in the area of public health policy.
>
> …
>
> I have published five papers and four letters on wind farms and health in peer-reviewed journals, and I believe I am the most published Australian researcher in this area. Five of these have been read online over 47,600 times. I have reviewed research on wind farms and health for the journals *Environmental Research*, *Noise and Health*, the *International Journal of Acoustics and Vibration*, *Energy Policy*, the journal *Psychosomatic Medicine*, and *Cureus*.[73]

1.144 The findings of Professor Chapman's research suggest that wind turbines themselves are not directly harmful to human health. Rather, as he explained, the highly variable pattern of complaints suggests psychosocial factors play an important role and that campaigns by opponents of wind farms are strongly associated with increased complaints:

> I have long formed the view that the phenomenon of people claiming to be adversely affected by exposure to wind turbines is best understood as a communicated disease that exhibits many signs of the classic psychosocial and nocebo phenomenon where negative expectations can translate into symptoms of tension and anxiety. The very obvious differential spatio-temporal distribution of complaints is the key indicator of this. It mirrors many past historical health panics about new technologies that have included the ordinary telephone, trains, television sets, electric blankets,

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72 Simon Chapman, Alexis St George, Karen Waller, Vince Cakic, '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*, 16 October 2013, http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0076584 ; See also Professor Chapman's response to criticisms of the methodology of this study raised by Dr McMurtry (*Committee Hansard*, 29 June 2015, p. 9) at Professor Simon Chapman, Answers to questions on notice arising from 29 June public hearing.

73 Professor Simon Chapman, *Committee Hansard*, 29 June 2015, p. 28; see committee majority comments at Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 18.

> power lines, computers, mobile phones and towers, and today's wi-fi and smart electricity meters.[74]

The link between expectations and individual's perceptions of health impacts

1.145 The suggestion that the nocebo mechanism, whereby 'negative expectations can translate into symptoms of tension and anxiety', would account for such a pattern of complaints, has found further support in the work undertaken by Ms Fiona Crichton at the University of Auckland.

1.146 It is disappointing that the majority report excludes Ms Crichton's work from its considerations. This work presents very compelling evidence that there is a direct link between people's exposure to anti-wind messages and their perceptions of infrasound from wind farms on their health.

1.147 Ms Crichton commented on how expectations of negative health effects from infrasound, based on misinformation, influence the interpretation of common physiological symptoms:

> Exposure to infrasound is a consistent and normal human experience. Infrasound is produced by air turbulence and ocean waves as well as by machinery such as air conditioners and by internal physiological processes such as respiration and heartbeat. Misinformation that exposure to a benign agent may cause health problems can trigger a nocebo response in the presence of that agent. A nocebo response occurs when the expectation of adverse health effects leads to increased symptom reporting. This happens because symptom expectations guide the detection and interpretation of common physiological symptoms, including normal somatic arousal caused by hypervigilance and elevated anxiety.[75]

1.148 Ms Crichton described peer-reviewed and published research she has undertaken to 'test the potential for expectations formed by accessing information disseminated through the media, particularly the internet, to determine subjective health assessment during exposure to both audible and subaudible wind farm sound.'[76] In summary, this research has demonstrated:

> …that expectations can influence symptom and mood reports in both positive and negative directions. The results suggest that how infrasound is framed can have a determinative impact on subjective health responses during exposure to wind farm sound, and that positive framing of sound could reduce reports of symptoms or negative effects. In further experiments, we have used the same experimental paradigm to investigate whether we can shift negative expectations once they are formed. This is important information if we are to address symptom reporting prompted by access to health warnings and negative beliefs about wind farms. We have found promising indications that changing the narrative about wind farms will go some way to improving health complaints.

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74 Professor Simon Chapman, *Committee Hansard*, 29 June 2015, p. 28.

75 Ms Fiona Crichton, *Committee Hansard*, 19 June 2015, p. 1.

76 Ms Fiona Crichton, *Committee Hansard*, 19 June 2015, p. 2.

> It is important to note that it was consistent across all experiments that providing people with material on the internet suggesting that infrasound produced by wind farms is causing symptoms in people living close to wind farms increased concerns about the health effects of wind farm sounds and resulted in increased symptoms and mood deterioration during simultaneous exposure to audible wind farm sounds and infrasound. However, when the narrative is changed so that more positive expectations or neutral expectations are formed, the experience is completely reversed. There was also consistent evidence across the experiments that negative expectations triggered noise annoyance responses and that positive expectations reduced noise annoyance.[77]

1.149 In a similar vein Dr Geoff Leventhall also suggested that misinformation campaigns by wind farm opponents had played a significant role in exacerbating reported health impacts:

> I believe that many opponents of wind turbines have latched onto infrasound and have used it as a stick with which to beat wind turbines. For the past 10 years or more the leading objectors to wind turbines have led a very successful propaganda campaign against wind turbines, partly based on supposed dangers of infrasound. They have tried very hard to inculcate negative attitudes and unhelpful thinking about wind turbines, so setting people up to be adversely affected. We are now in a confused situation in which many people hold sincere beliefs about infrasound, but these beliefs are based on false information which have been fed to them by well-organised objector groups and their allies. This skilful and successful misinformation campaign, which is largely based on repetition, serves only to heighten adverse effects whilst holding back research in significant areas.[78]

1.150 The Australian Psychological Society noted the stress and anxiety that stem from misinformation in its submission:

> An important cause of community resistance to wind turbines, therefore, is misinformation that is spread about the impact of wind farms (e.g., on health, fauna, property values etc) through social groups, via anecdotal stories, or through anti-wind lobby groups. Concerns might be fuelled by the popular media, opinion pieces, news articles, websites and word of mouth.
>
> 'Misinformation' refers to information that people have acquired that turns out to be incorrect, irrespective of why and how that information was acquired in the first place. Once fear and confusion have been created by misinformation in communities, it can cause ongoing community division and discord. All of this can lead to increased physiological arousal and stress symptoms. Many of the health effects which are reported to arise

77 Ms Fiona Crichton, *Committee Hansard*, 19 June 2015, p. 2.

78 Dr Geoff Leventhall, *Committee Hansard,* 23 June 2015, p. 9.

> from wind farms are very common physiological responses to stress and anxiety.[79]

1.151 The Climate and Health Alliance also recognised the link between expectations upon positive or negative health outcomes:

> Several studies demonstrated anxiety about the sound source elevates negative responses, and this underpins a potential source of tension. The association between expectations and health outcomes dates back to Hippocrates and is well established in the health psychology literature. The influence of pre-intervention expectations upon positive or negative outcomes is consistently demonstrated across a range of health endpoints, including weight loss, smoking cessation,and post-operative recovery.[80]

The international experience

1.152 Labor Senators note important evidence received that entire countries with significant numbers of installed wind turbines appear to be free of any community concern regarding their alleged negative health effects.

1.153 Professor Chapman stated that concerns about the health impacts of wind farms appear to be largely restricted to English-speaking countries:

> When I travel to Europe, which I do often for my work, I am often in the presence of colleagues who are working in public health and I raise this issue with them. Sometimes they say to me, 'Look, what is it that you are asking?' And I have to go through it again carefully, and they say, 'We have never heard of anything like this.' Friends of mine who have gone walking on the pilgrim's walk in northern Spain made an effort to ask local people as they walked across that, 'Are these wind farms that we are seeing affecting you?' The people looked at them as if they must be strange. They had never heard of anything like this.
>
> So it is, as some people have observed, a phenomenon which perhaps speaks English. Of course, people working in other countries which are not anglophone do publish a lot in anglophone journals—in English-speaking journals—so the idea that there would be researchers who have information and are not putting it out in the English-language academic press is also not very credible.[81]

1.154 Ms Kim Forde provided similar testimony about her firsthand experience of community attitudes to wind farms in Ireland. She stated that 'the perception of the impact of infrasound, has blown out of all proportion—again, from people who have fears about the wind farm' and commented that:

> I agree that the perception of the exposure to antiwind messages certainly leads to uncertainty. I am actually in Ireland at the moment, and I was at an Irish wind farm in the south of Ireland yesterday speaking with people

79 Australian Psychological Society, *Submission 406*, p. 5.

80 Climate and Health Alliance, *Submission 331*, pp 5–6.

81 Professor Simon Chapman, *Committee Hansard*, 29 June 2015, p. 30.

> about exactly this process. They were talking about the fact that they have almost no protests here against wind farms and they find it quite amusing that in the places where there are new wind farms being proposed, places like Australia, there is a protest against it—where there is a protest group or people with an interest, or some perceived interest, in preventing them happening. Whereas here, where people have an alternative to wind—potentially nuclear—these people go, 'We want wind. We can't see a problem with it. We have them.'[82]

1.155 This observation was supported other witnesses. Mr Peter Rae, a former Liberal Senator for Tasmania with extensive experience in the renewable energy sector, informed the committee:

> In my experience around the world there are a only few centres where this concern appears to arise and be concentrated.
>
> Overall it is not a matter which arises until the risk of it is raised by people who do not like having wind turbines placed near to where they live.
>
> I have not heard of any occasion where those who work at operating wind farms have expressed the health concern.
>
> It follows that, as the complaints arise selectively, then considerable caution should be adopted in making any findings on the issue and, in particular, in imposing further restrictions and costs based upon that concern.[83]

1.156 Mr Danny Nielsen, Managing Director of Vestas Australian Wind Technology, also supported this view:

> I have worked for Vestas for over 17 years and can nominate many countries including China, Japan, Taiwan, Korea, Pakistan, India, the USA, the Philippines, Ireland, Sweden and Greece where the sort of health claims made by anti-wind energy activists in Australia have not come to my attention during my time there.[84]

1.157 Ms Megan Wheatley of Senvion Australia, in response to a question regarding the highly uneven global distribution of health complaints regarding wind farms, made the following statement:

> I will answer that by quoting our global CEO, Andreas Nauen. He was in Australia a few years ago and he was surprised by the level of debate about wind farms and health. At that time, he spoke about having very specific discussions in other countries about things like warning lights for high towers and said:

82 Ms Kim Forde, *Committee Hansard,* 19 May 2015, p. 81.

83 The Hon Peter Rae AO, Documents tabled at 29 June public hearing, p. [9].

84 Mr Danny Nielsen, Answers to questions on notice arising from 9 June 2015 public hearing, p. [4].

> It's always a very solution orientated discussion… but this fundamental discussion of wind turbines causing illnesses, I don't see it anywhere else in the world.[85]

1.158 The committee received a submission and heard evidence from Ms Lilli-Ann Green, a resident of the United States, who stated she had conducted interviews with people claiming to be negatively affected by wind turbines in 15 different countries, both English and non-English speaking.[86]

1.159 Ms Green testified that she runs a 'healthcare consultancy', of which she is the only employee, that has delivered 'educational programs' to 300,000 physicians. However, Ms Green was unwilling to provide the name of her company to the committee. Ms Green was also unwilling to provide the committee with transcripts of these interviews or with the names of the interviewees. Ms Green further informed the committee that the subjects of her interviews were a self-selected group with pre-existing grievances about wind farms based either on perceived health effects or other matters. Finally, Ms Green stated that she has no qualifications in health care or medicine.[87]

1.160 Labor Senators caution that, based on the scant detail supplied, Ms Green's series of interviews appears to have no scientific value if taken as a study of community reactions to wind farms in different countries.

1.161 Labor Senators are convinced that there are notable differences in the level and nature of concerns about wind farms in different countries. This uneven distribution of concerns suggests that factors other than direct causal links between wind turbines and health impacts must be considered.

Thousands of wind farm workers suffer no ill-effects

1.162 A further difficulty confronting claims that wind turbines are directly harmful to human health, whether via infrasound emissions or by some other mechanism, is presented by the fact that the workforces of wind turbine manufacturers and operators report no such ill effects, despite working in very close proximity to wind farms on a daily basis. In response to a question regarding the health effects of infrasound, Mr Ken McAlpine of Vestas Australian Wind Technology, stated:

> …we have employees who work at close range to wind turbines every day of the year in all sorts of conditions. You would expect from that that, if there were something harmful coming from the machine or its operation, our people would be first in line to cop it.
>
> …
>
> We have 5½ thousand people who work out in the field operating wind turbines. They work inside them. They go up. They have sites that are

85 Ms Megan Wheatley, *Committee Hansard*, 29 June 2015, pp 34–35.

86 Ms Lilli-Ann Green, *Submission 467*; Ms Lilli-Ann Green, *Committee Hansard*, 29 June 2015, pp 1–6.

87 Ms Lilli-Ann Green, *Committee Hansard*, 29 June 2015, pp 4–5.

> within hundreds of metres of the turbines themselves. It is not just manufacturing that Vestas does; it is an operator of wind turbines too.[88]

1.163 Senvion Australia, a company that employs over 3,400 people and has installed over 6,000 wind turbines, also submitted that its workforce appeared to be completely unaffected by working in close proximity to wind turbines and wind farms on a daily basis.[89] Their submission states:

> As a company with employees working on operating wind turbines and living near wind farms, we have not seen any ill health effects resulting from wind energy generation.[90]

1.164 Their submission also quoted one of their engineers, James Miele:

> I have spent a huge amount of time living and working in the vicinity of wind turbines. I can state without any doubt that neither I or anybody I know has ever experienced any ill effects from wind turbines.[91]

Infrasound

1.165 The committee received considerable volumes of evidence relating to infrasound—that is, sound below a frequency of 20 Hz—and devoted time at its public hearings to discussing the possibility that infrasound emitted by wind farms might directly affect human health.

1.166 While the majority report seeks to suggest the World Health Organization supports the proposition that wind turbines have human health impacts, the WHO explicitly outlines the safe level of infrasound exposure:

> Sound characterised by frequencies between 1 and 20 Hz is called infrasound and is not considered damaging at levels below 120 dB.[92].

1.167 Labor Senators note that wind farms constructed under Australian planning regimes would never exceed the levels outlined by the WHO.

1.168 Mr Christopher Turnbull from the Association of Australian Acoustical Consultants explained that infrasound from wind farms is very similar to infrasound from other sources:

> Certainly the level of infrasound from wind turbines is very similar to the level of infrasound from other sources. I have personally measured the noise from waves at beaches and at cliffs in the city and in other areas; other members of this panel have, for example, measured the infrasound

88 Mr Ken McAlpine, *Committee Hansard*, 9 June 2015, p. 31.

89 Ms Megan Wheatley, *Committee Hansard*, 29 June 2015, p.

90 Senvion Australia, *Submission 404*, p. 6.

91 Senvion Australia, *Submission 404*, p. 6.

92 World Health Organization, *Occupational Exposure to Noise: evaluation, prevention and control*, p.41, http://www.who.int/occupational_health/publications/occupnoise/en, accessed 2 August 2015; see committee majority comments at Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p.17.

> produced by the change in pressure as people walk; and the levels of infrasound from a wind farm are very similar to those levels that we have just described.[93]

1.169 In relation to whether the research supports the idea that wind farms may have human health impacts, Mr Turnbull said:

> I am not aware of any that has found a link between wind turbines and health. I have certainly read some articles which indicate that there is a hypothesis that there might be, but I have certainly not seen any direct link in any paper that I am aware of.[94]

1.170 Dr Renzo Tonin of the AAAC also confirmed that there are no studies confirming that infrasound from wind farms has human health impacts:

> All of the research articles that have been published claiming links between wind farm noise and health basically set a hypothesis for a connection between infrasound and the ability of the human body to respond to that infrasound. They do not prove a connection in any way between adverse health and infrasound.[95].

1.171 Dr Tonin went on to explain the research he had personally completed in this area:

> Therefore, what I did in my research last year, presented at the Wind Turbine Noise conference just recently, was to take the highest level of measured infrasound, which to date has been at the Shirley Wind Farm and which I believe the senators would be aware of, and consented to 72 participants ranging in age from about 18 to the late 60s I think it was. What we found was that in presenting that level, which is at a level of 90 decibels at 0.8 Hz and the highest measured anywhere in the world to date, there was no correlation between that level of infrasound and a person's reported symptoms—and there were about 20 different symptoms…[96]

1.172 The assertion that there is something unique or different about infrasound from wind turbines that may be leading to human health impacts was disputed by acoustician Dr Norm Broner:

> Infrasound level in various situations has now been fully documented. Infrasound level near to wind turbines is really not that different from many other anthropomorphic and natural noise sources—for example, walking on the beach or travelling in a car, train or plane, you are exposed to levels of infrasound either higher or similar to those from wind turbines. I would hazard a guess that where the committee is currently sitting today you are exposed to levels of infrasound similar to that generated by wind turbines.

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93 Mr Christopher Turnbull, *Committee Hansard*, 10 June 2015, p.5.

94 Mr Christopher Turnbull, *Committee Hansard*, 10 June 2015, p.5.

95 Dr Renzo Tonin, *Committee Hansard*, 10 June 2015, p.5

96 Dr Renzo Tonin, *Committee Hansard*, 10 June 2015, p.5.

> But I do not think any of you would be claiming that you are not feeling well because of it.[97]

1.173 Dr Broner noted work in Japan by Tachibana which found no problems with infrasound from wind turbines.[98].

1.174 Testimony from Mr Peter Dolan of the South Australian EPA supported the position that infrasound from wind turbines is imperceptible by humans:

> With infrasound, the lower the frequency, the harder it is to perceive, and it is generally accepted that you cannot perceive infrasound until 85 dBG, which is the range we tend to use. The levels we are finding near wind farms are much, much lower than that; they are in the order of 30 dBG.[99]

1.175 Mr Dolan also rejected the suggestion that individuals are adversely affected by infrasound from wind turbines:

> I am not aware of evidence that thousands of people are adversely exposed. I am aware that we probably have three-quarters of the million people in Adelaide exposed to excessive traffic related infrasound. We are really talking about the difference between the nature of infrasound from a wind farm and from other sources, because, clearly, many millions of Australians are affected by infrasound from road traffic.[100]

1.176 A study conducted by the South Australian Environment Protection Authority came to the following conclusions regarding infrasound from wind turbines:

> From an overall perspective, measured G-weighted infrasound levels at rural locations both near to and away from wind farms were no higher than infrasound levels measured at the urban locations. The most significant difference between the urban and rural locations was that human activity and traffic appeared to be the primary source of infrasound in urban locations, while localised wind conditions appeared to be the primary source of infrasound in rural locations. Of particular note, the results at one of the houses near a wind farm (Location 8) are the lowest infrasound levels measured at any of the 11 locations included in this study.
>
> This study concludes that the level of infrasound at houses near the wind turbines assessed is no greater than that experienced in other urban and rural environments, and is also significantly below the human perception threshold.[101]

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97 Dr Norm Broner, *Committee Hansard*, 29 June, p. 82.

98 Dr Norm Broner, *Committee Hansard*, 29 June 2015, p. 83.

99 Mr Peter Dolan, *Committee Hansard*, 29 June 2015, p. 12.

100 Mr Peter Dolan, *Committee Hansard*, 29 June 2015, p. 13.

101 South Australian Environment Protection Authority, *Infrasound levels near windfarms and in other environments*, January 2013, p. 41, http://www.epa.sa.gov.au/environmental_info/noise/types_of_noise/wind_farms

1.177 Former President of the United Kingdom Institute of Acoustics, Dr Geoff Leventhall, noted that there is significant misunderstanding regarding infrasound from wind turbines:

> There are many misconceptions about infrasound. It has even become associated with surreal and paranormal events or described as a subtle weapon and cause of illness. Much of this misunderstanding arises from not appreciating that the word 'infrasound' used on its own has only a limited meaning related to a frequency range. Full meaning comes from the inclusion of actual frequencies and levels. One should not make claims about infrasound without also giving the relevant frequencies and levels[102].

1.178 Dr Leventhall also rejected the theory that infrasound from wind farms could be causing human health impacts:

> In a paper I published nearly 10 years ago about infrasound from wind turbines I said that wind turbines produce infrasound but the levels are very low and of no consequence. Wind turbines produce low-frequency noise, especially when there is turbulence in the inflow air, and the low-frequency noise can sometimes be audible. But we hear low-frequency noise all the time. It is not something to be afraid of.[103]

1.179 Labor Senators support the NHMRC's effort to encourage further rigorous research on wind turbines and human health; however, it is important to note that the inherent characteristics of infrasound make it a very poor candidate as an explanation for the range of symptoms attributed to the operation of wind farms. First, infrasound emissions from wind turbines are not generally of sufficient sound pressure level to make them perceivable.[104] Second, infrasound is present in all environments, both rural and urban, and often at higher levels than those recorded near wind farms.

1.180 Arguments suggesting infrasound emissions from wind farms are dangerous to human health must therefore overcome the obvious difficulties that such emissions are imperceptible and that they are also found, often at higher levels, in non-wind-farm exposed environments without any reported health effects. No convincing evidence to counter these objections was provided to the committee.

The Cape Bridgewater study

1.181 The recent study of Pacific Hydro's Cape Bridgewater wind farm conducted by Mr Steven Cooper of the Acoustic Group Pty Ltd was cited by some as evidence of a direct link between infrasound emissions from wind farms and reported symptoms

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102 Dr Geoff Leventhall, *Committee Hansard*, 23 June 2015, p. 9.

103 Dr Geoff Leventhall, *Committee Hansard*, 23 June 2015, p. 12.

104 For a discussion of the threshold of perception for infrasound, see South Australian Environment Protection Authority, *Infrasound levels near windfarms and in other environments*, January 2013, pp 3–5, http://www.epa.sa.gov.au/environmental_info/noise/types_of_noise/wind_farms

of nearby residents.[105] Many of the majority committee members raised particular concern about the implications of this study.

1.182 However, Labor Senators note that Mr Cooper and Pacific Hydro issued a joint statement on 16 February 2015 emphasising, among other things, the following points:

- The Acoustic Group and Pacific Hydro agree that the study was not a scientific study.
- The Acoustic Group and Pacific Hydro agree that the report does not recommend or justify a change in regulations.
- The Acoustic Group and Pacific Hydro agree this was not a health study and did not seek or request any particulars as to health impacts.[106]

1.183 Labor Senators assert that the claim in the majority report that 'Mr Steven Cooper found a correlation between infrasound emitting from turbines at Cape Bridgewater and 'sensations' felt, and diarised, by six residents of three nearby homes' is incorrect and has been thoroughly and effectively discredited by multiple witnesses to the inquiry.[107]

1.184 Both Pacific Hydro and Mr Cooper have emphasised that the study was undertaken within a very limited brief. The intention of the study was only to 'see whether any links could be established between certain wind conditions or sound levels at Cape Bridgewater and the disturbances being reported by these six local residents' noting that the windfarm is compliant with relevant noise regulations.[108]

1.185 Beyond these limitations, the study was also severely criticised by expert acousticians on the basis of apparent flaws in its methodology. For example, the Association of Australian Acoustical Consultants (AAAC) reviewed Mr Cooper's Cape Bridgewater study and came to the following conclusions:

> The overall conclusion drawn from the review is that the Study provides no new credible scientific evidence, and further, no scientific evidence to support the media reporting positively of the Study.
>
> The Study measures infrasound at the blade pass frequency and multiples of the blade pass frequency. The level of infrasound is similar to the levels

105 See Pacific Hydro, 'Cape Bridgewater Wind Farm Acoustic Study', http://www.pacifichydro.com.au/english/our-communities/communities/cape-bridgewater-acoustic-study-report/, accessed 23 July 2015.

106 Pacific Hydro and The Acoustic Group, 'Joint statement – Pacific Hydro & The Acoustic Group', p. 1, http://www.pacifichydro.com.au/files/2015/02/Pacific-Hydro-The-Acoustic-Group-Joint-statement-16-February.pdf, accessed 23 July 2015.

107 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p.11

108 Pacific Hydro and The Acoustic Group, 'Joint statement – Pacific Hydro & The Acoustic Group', p. 2, http://www.pacifichydro.com.au/files/2015/02/Pacific-Hydro-The-Acoustic-Group-Joint-statement-16-February.pdf, accessed 23 July 2015; see also Mr Andrew Richards, *Committee Hansard*, 30 March 2015, p. 13.

> measured previously by others and is well below the threshold of human perception.
>
> The Study suggests that there is a "pattern" of high severity disturbance associated with four turbine operating modes. When all data are considered, there are limitations, contradictory and limited data and the results do not support the description of a "pattern".
>
> The Study includes a hypothesis that "sensations" felt by the participants might be related to the measured level of infrasound. The hypothesis is based on a very limited subset of the data, with any data excluded from the analysis if it did not fit the theory. When all data are considered, the evidence does not support the hypothesis.[109]

1.186 The AAAC elaborated on this critique in its appearance before the committee:

> The problem is that those occasions when people felt these sensations when the turbines were off were simply ignored in any analysis that was conducted. If you are to conduct analysis, it needs to be done on a statistical basis by a statistician who understands all of the compounding factors and has a scientific approach rather than simply ignoring things and choosing the data that suits the theory they might have.[110]

1.187 In response to Mr Cooper's claim that his study had been 'hailed around the world as finding new information and material previously not put together or understood with regard to windfarms', and that his methodology should therefore be repeated in expanded studies, the AAAC informed the committee that:

> What Mr Cooper has done is nothing new. He has measured what is called the wind turbine signature, which, as Mr Turnbull has said, has been around for decades. We all know about that. In fact, if you look at the Shirley wind farm it presents the same information. So there is nothing new about that. Mr Cooper suggests that what he has done should form the basis of monitoring at all wind turbines. I do not agree with that. What we need to get to the heart of are the claims that link infrasound and health. You do not do that by following Cooper's methodology. You do that by exploring the next step of the Creighton/Tonin and hopefully NHMRC methodology, which is to expose people to exactly what some people complain of and to scientifically and medically measure the health responses and the symptoms to that exposure. That is the way forward. I would hopefully suggest that senators give support to the NHMRC funding to come on-stream later this year to do just that.[111]

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109 Association of Australian Acoustical Consultants, *Submission 194*, p. [1].

110 Mr Chris Turnbull, *Committee Hansard*, 10 June 2015, p. 12.

111 Dr Renzo Tonin, *Committee Hansard*, 10 June 2015, p. 11. Professor Simon Chapman has supported the AAAC analysis and noted that he is preparing a critique of the Cooper study to be 'submitted to an international peer reviewed journal as a case study illustration of how "research" with manifest problems can be used by opponents of renewable energy to advance their goals'. See Professor Simon Chapman, Answers to questions on notice arising from 29 June public hearing.

1.188 Dr Leventhall, who has significant expertise in the area of infrasound also expressed the view that the Cooper report did not establish any new connection between infrasound and health effects:

> This report has received many plaudits in the media, ranging from "ground-breaking" to "pointing the way for future medical research". Following a detailed study of the report, I do not agree that these plaudits are deserved. The report is useful in its detail, but it reveals little new and has ignored what should be its most obvious conclusions. It is clear that Mr Cooper came to the work with the firm conviction that inaudible infrasound was a problem and cared only to develop that theme. However, what the report actually shows is that those affected are responding to audible noise, and exhibiting well known stress responses to an unwanted noise, even though this noise is normally at a very low level. The report indicates that infrasound is not an issue.[112]

1.189 Dr Elizabeth Hanna also emphasised that the Cape Bridgewater study did not meet any of the methodological requirements needed to establish an association between exposure to wind turbines and health effects, whereas the Health Canada study did meet these requirements and found no such association:

> You also have to make sure that any health reported issue is not caused by other reasons, or by the fact that a lot of people cannot sleep, a lot have tinnitus, a lot have high blood pressure and so on and so forth. You have to be able to determine the fact that there is a real and genuine increase in the standard health problems—the 150 or so that have been attributed. You have to be able to show that there is a marked and significant elevation in those health problems for those people who are living in proximity, close enough, and are actually exposed. You also have to show the time scale—the fact that they were healthy, exposure happened, and then they got sick. It is a complex, quite detailed and very expensive study that would need to be able to show that. Health Canada did a particularly good job at that, as compared to the study that has so often been reported in this committee—Cooper's study—which was not a scientific study, as he would argue.[113]

1.190 Labor Senators note that Mr Cooper testified in proceedings against the Stony Gap Wind Farm in the South Australian Environment, Resources and Development Court. Mr Cooper's evidence was dismissed, with the judgement stating the following in relation to Mr Cooper's work:

> At present, on the basis of his evidence before us, it seems that his approach to the task includes privileging the subjective experiences of those residents who have experienced problems, and their perceptions as to the cause of these experiences, over other contradictory data. The investigations by the EPA and Mr Turnbull in relation to the same or similar material have not yielded any basis for refusing to grant development plan consent to the

112 Dr Geoff Leventhall, *Submission 379,* p. 4.

113 Dr Elizabeth Hanna, *Committee Hansard*, 19 June 2015, p. 20.

> proposed development on the basis of noise generally, infrasound or low frequency noise.[114]

1.191 Labor Senators believe the evidence received by the committee supports the contention that Mr Cooper has employed a similar approach in the Cape Bridgewater study that he was criticised for by the South Australian court.

1.192 Labor Senators conclude that the Cape Bridgewater study conducted by Mr Cooper provides no scientific evidence of a connection between infrasound emitted by wind farms and health effects and that this study does not provide a foundation for changing the planning and monitoring regime governing wind farms.

Response to specific health impact claims in the majority report

1.193 The majority report makes reference to a number of sources to support the proposition that wind farms are directly linked to human health impacts. Labor Senators are not persuaded that any of the sources provided offer any credible evidence of health impacts from wind farms.

1.194 The majority report devotes significant space to the testimony of Ms Sarah Laurie to support its contention that wind farms are the direct cause of human health impacts. Ms Laurie was once a registered doctor but, after a complaint was filed with the Australian Health Practitioner Regulation Agency in 2013 that her activities constituted practice as a physician, Ms Laurie voluntarily agreed not to use the title Doctor.

1.195 Labor Senators note that Ms Laurie's evidence has been rejected in a number of court proceedings against specific wind energy developments.

1.196 Mr Laurie gave evidence against the Stony Gap Wind Farm in 2014, but it was rejected by the judge, who made the following findings:

> Dr Laurie's evidence does not contain evidence (whether from her own research, or that of others) of a causal link between contemporary operating wind turbines and the kind of health problems reported by the deponents, which is consistent with any accepted scientific or legal method of proof.
>
> …
>
> Dr Laurie wishes to have investigated the theory that some people are "so exquisitely sensitised to certain frequencies that their perception of very, very low frequency is right off the shape of the bell curve", such that they can, for example, from Australia, perceive an earthquake in Chile.
>
> …
>
> Dr Laurie rejects all of the studies, including the EPA studies, which are not consistent with her theories. She admits that evidence showing a causal connection between contemporary wind farms and health effects does not

114 Environment, Resources and Development Court of South Australia, *Tru Energy Renewable Developments Pty Ltd v Regional Council of Goyder and Ors*, p.18.

> exist, and she seeks to have more research done in the hope that such evidence will be generated in the future.
>
> …
>
> There is no basis for the refusal of development plan consent to the proposed development on the grounds of health effects. [115]

1.197 In 2013 Ms Laurie participated in a case relating to the Dufferin Wind Power Project, which went before the Environmental Review Tribunal in Ontario, Canada. In this case, the tribunal rejected claims of human and animal health impacts. It also refused permission for Ms Laurie to give opinion evidence (the equivalent of expert evidence in Australian courts). It went into extensive detail on its reasons for this decision over many pages. A small excerpt follows:

> However, the Tribunal has already found that Ms. Laurie cannot be qualified to give opinion evidence based on formal medical or scientific research, or research design and methodology. The Tribunal has also found that she cannot be qualified to give opinion evidence requiring diagnostic opinions, or the application of diagnostic interpretation to formulate conclusions on the potential health impacts of exposure to operating industrial wind turbines. This raises the question whether she can be qualified to give her proposed opinion evidence on the basis of the experience she has obtained through self-study of the published research and other literature. The Tribunal accepts that the time Ms. Laurie has devoted to this aspect of her work experience is not insignificant. However, Ms. Laurie's evidence does not indicate that she has conducted a comprehensive review of all literature, nor that she has the expertise to assess the sufficiency of the research methodology in individual research studies. Consequently, the Tribunal finds that her self-study of the published literature, as described in her witness statement, even if considered in conjunction with her survey of self-identified participants, is not sufficient to meet the basic threshold of reliability necessary to assist the Tribunal in making a sound decision.
>
> In summary, the Tribunal has found that the Appellant, Mr. Sanford has not established a basis on which Ms. Laurie can be qualified to give her proposed opinion evidence in this proceeding. [116]

1.198 In 2013, Ms Laurie was given permission to testify in a hearing for the Bull Creek Wind Project in Alberta, Canada. However, in its decision the Alberta Utilities Commission made these comments about Ms Laurie:

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115 Environment, Resources and Development Court of South Australia, *Tru Energy Renewable Developments Pty Ltd v Regional Council of Goyder and Ors*, 4 November 2014, p. 29, p. 30, p. 38.

116 Judgement of the Environmental Review Tribunal in the case of Bovaird v.Director, Ministry of the Environment, pp 108–109, http://www.dufferinwindpower.ca/Portals/23/Downloads/Final/ERT%20decision%20DWPI%20dec%2023-13.pdf , accessed 3 August 2015.

> Dr. Laurie's written evidence also included her interpretation and discussion of numerous published and unpublished epidemiological and acoustical reports and studies. In the Commission's view, Dr. Laurie lacks the necessary skills, experience and training to comment on the interpretation of epidemiologic studies or the interpretation of acoustical studies and reports. The Commission gave little weight to this aspect of Dr. Laurie's evidence.[117]

1.199 Labor Senators are persuaded that testimony from Ms Laurie regarding the health impacts of wind farms should be treated with caution.

1.200 The majority report also calls upon evidence from Ms Laurie about a number of studies 'that has identified adverse health effects on humans of low frequency sound', including work completed by Dr David Iser, Professor Alex Salt and the Inagaki study in Japan.[118]

1.201 The majority report refers to Dr David Iser as 'the first General Practitioner in Australia to report adverse health effects from wind turbines'.[119].

1.202 Dr Iser, testified to the committee that, as a local general practitioner, he was made aware that there may be adverse health impacts of wind farms. Dr Iser told the committee that, as a result, he undertook a literature review with the outcome that 'there were no significant adverse health effects of a physical nature that I could find in the literature'.[120]

1.203 With this in mind, Dr Iser distributed 25 questionnaires to residents living near the Toora Wind Farm to determine if there were any health problems. Among the respondents, 12 reported no health problems, 5 reported mild problems, and 3 reported 'major health problems including sleep disturbance, stress and dizziness'.[121]

1.204 In response to his testimony, Dr Iser was asked a number of questions on notice about his survey, including whether he attempted to determine a direct causal link between wind farms and respondents' concerns, whether he asked any questions in an attempt to rule out other potential causes of health impacts and whether he received any substantiating medical data from the respondents. Dr Iser did not respond directly to the questions put to him on notice. Instead, he stated 'my reply is based on the fact that the survey was very much an initial survey'.[122]

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117 Alberta Utilities Commission Decision 2014-040, 20 February 2014, p. 69, http://www.auc.ab.ca/applications/decisions/Decisions/2014/2014-040%20%28Errata%29.pdf , accessed 3 August 2015.

118 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 24.

119 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 24.

120 Dr David Iser, *Committee Hansard*, 9 June 2015, p. 80.

121 Dr David Iser, *Committee Hansard*, 9 June 2015, pp 80–81.

122 Dr David Iser, Answers to questions on notice from arising from 9 June 2015 public hearing, p. 1.

1.205 Due to the small sample size and the lack of any attempt to determine the wider medical context of individual respondents, Labor Senators do not believe that Dr Iser's questionnaire provides evidence of a causal link between wind turbines and human health.

1.206 Labor Senators are also disappointed that the majority members of the committee chose to highlight this unscientific study while failing to recognise the extensive and scientifically-grounded processes of the NHMRC's work on wind turbines.

1.207 Another researcher mentioned in the majority report is Professor Alec Salt, who is described as 'the leading expert in inner ear fluid physiology, detailing the effects of low frequency sound on the ear and how wind turbines can be hazardous to human health. '[123]

1.208 This assertion does not concur with the findings of the majority of medical and acoustical experts and bodies outlined earlier in this chapter. Professor Salt's claim was specifically criticised by Bolin et al in a peer-reviewed article on infrasound and low frequency noise from wind turbines:

> Salt and Hullar (2010) hypothesized from previous research that the outer hair cells are particularly sensitive to infrasound even at levels below the threshold of perception. In their article, the last paragraph mentions that wind turbines generate high levels of infrasound, with reference to three articles, two of which are not relevant to exposure in residential environments (Jung and Cheung 2008, and Sugimoto *et al* 2008). No references were made to published compilations of knowledge that indicates that the infrasound to which humans are exposed to by wind turbines is moderate and not higher than what many people are exposed to daily, in the subway and buses or at the workplace (e.g. Leventhall 2007, Jakobsen 2005). It is therefore hard to see that Salt and Hullars' results are relevant for risk assessment of wind turbine noise in particular[124].

1.209 In the same article, Bolin et al concluded that:

> The dominant source of wind turbine low frequency noise, LFN (20–200 Hz), is incoming turbulence interaction with the blade. Infrasound (1–20 Hz) from wind turbines is not audible at close range and even less so at distances where residents are living. There is no evidence that infrasound at these levels contributes to perceived annoyance or other health effects. LFN from modern wind turbines are audible at typical levels in residential settings, but the levels do not exceed levels from other common noise sources, such as road traffic noise. Although new and large wind turbines

123 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 24.

124 Bolin, K., Bluhm, G, Eriksson, G, and Nilssen, ME, 'Infrasound and low frequency noise from wind turbines: exposure and health effects', Environmental Research Letters, Vol 6, No.3 2011, p.4.

> may generate more LFN than old and small turbines, the expected increase in LFN is small.[125]

1.210 In response to a question about the Inagaki study, which the majority report claims 'found physiological effects from aerodynamic sound from wind turbines'[126], the AAAC wrote:

> With regards to infrasound, the Inagaki study played a synthesised level of infrasound to subjects at a level of 92 dB(G) and a frequency of 20 Hz. The level of 92 dB(G) is significantly higher than that produced by modern wind turbines even very close by, and furthermore is at or near the mean hearing threshold for infrasound. It is therefore not surprising that some subjects may have perceived the sound at these artificially high levels. Additionally, 20 Hz is not a common infrasonic frequency associated with wind turbines, with blade pass frequencies occurring at frequencies lower than 10 Hz.[127]

1.211 The majority report also calls upon the work of Nina Pierpont, who is credited with coining the term 'Wind Term Syndrome' in her self-published book of the same name. Labor Senators note that this work has been heavily criticised as having no scientific value.

1.212 Specifically, Dr Pierpont's work has been criticised for having a tiny, self-selected sample group, acceptance on hearsay on additional people as direct evidence, no control group and no medical examinations or medical data was taken.

1.213 Professor Chapman has outlined a number of flaws in Dr Pierpont's work:

> Her reputation as an authority on "wind turbine syndrome" is a 2009 self-published book containing descriptions of the health problems of just 10 families (38 people, 21 adults) in five different countries who once lived near wind turbines and who are convinced the turbines made them ill. With approximately 100,000 turbines worldwide and uncounted 1,000s living around them, her sample borders on homeopathic strength representativeness.[128]

1.214 Labor Senators also note that the symptoms reported by Dr Pierpont as being attributable to 'Wind Turbine Syndrome' are actually very common. Ms Fiona Crichton, who has done work on the prevalence of symptoms in the general population said on this matter:

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125 Bolin, K., Bluhm, G, Eriksson, G, and Nilssen, ME, 'Infrasound and low frequency noise from wind turbines: exposure and health effects', Environmental Research Letters, Vol 6, No.3 2011 p.5.

126 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 24.

127 Association of Australian Acoustical Consultants, Answers to questions on notice from arising from 10 June 2015 public hearing, p.7.

128 Professor Simon Chapman, 'Wind turbine sickness prevented by money drug', 29 March 2011, www.abc.net.au/news/2011-03-29/windturbinesicknesspreventedbythedruge2809cmoneye28/45730, accessed 2 August 2015.

> Further, the experience of symptoms is very common. In fact, a recent population survey we conducted in New Zealand found that almost 90 per cent of respondents experienced at least one symptom over the past week, the median number of symptoms experienced was five and 23 per cent of the population reported 10 or more symptoms. Therefore, it is very simple for individuals to misattribute their common experience of symptoms to an innocuous environmental agent if they have health concerns about exposure to that agent[129].

1.215 The majority report also notes the Shirley Wind Project in the United States has found that the Shirley Wind Farm was 'a human health hazard'.[130]

1.216 In relation to this Project, the AAAC wrote:

> The Shirley Wind Farm report did not prove a link between infrasound from wind farms and health impacts.
>
> It concluded:
>
> "The four investigating firms are of the opinion that enough evidence and hypotheses have been given herein to classify LFN and infrasound as a serious issue, possibly affecting the future of the industry. It should be addressed beyond the present practice of showing that wind turbine levels are magnitudes below the threshold of hearing at low frequencies."
>
> The conclusion is that infrasound is a "serious issue" which could "possibly" affect the industry but that there should be further investigation.
>
> That is not the same as saying there is a proven link.[131]

1.217 Labor Senators also note a news report from 3 March 2015 that the Brown County Health Board met and were unable to agree on the next step to be taken regarding the Shirley Wind Farm.[132]

1.218 Reference was also made in the majority report to Professor McMurtry's 'peer reviewed papers on the criteria for diagnosis of illness from wind turbines.' Regarding Dr McMurtry's work, Labor Senators note these criteria were published in the *Bulletin of Science, Technology and Society*.

1.219 The *Bulletin of Science, Technology and Society* is notable in that it has published the great bulk of the literature purporting to support a link between wind turbines and human health. For example, in one listing of '21 Peer Reviewed Articles

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129 Ms Fiona Crichton, *Committee Hansard*, 19 June 2015, p. 1.

130 Senate Select Committee on Wind Turbines, Final Report, August 2015, p.16

131 Association of Australian Acoustical Consultants, Response to questions on notice arising from 10 June public hearing, pp 8–9.

132 *Green Bay Press Gazette*, 'No action on wind farm', 3 March 2015, http://www.greenbaypressgazette.com/story/news/local/2015/03/03/action-wind-farm-county-health-board/24351511/ , accessed 2 August 2015.

on the Adverse Health Effects of Wind Turbine Noise' posted on a prominent wind opposition website, every single article comes from this publication.[133]

1.220 Professor Chapman provided evidence to the committee that this publication was de-indexed 20 years ago:

> But after 1995 it was dropped from the list of journals being indexed, generally a sign that indexing services regard a journal as having fallen below an acceptable scientific standard.[134].

1.221 In the same response to questions on notice, Professor Chapman also pointed out that Dr McMurty's claim that the publication is indexed in Index Medicus is incorrect, as Index Medicus itself ceased publication in 2004.

1.222 Dr McMurty's case definition was also dismissed as evidence in the Ostrander Point tribunal, Alliance to Protect Prince Edward County v. Director, Ministry of the Environment in 2013. On this case study, the decision read:

> With respect to the proposed Case Definition of AHE/IWTs, the Tribunal finds that it is a work in progress. It is preliminary attempt to explain symptoms that appear to be suffered by people with whom Dr. McMurtry is familiar, who live in the environs of wind turbines. Dr. McMurtry's case definition has admittedly not been validated; thus there is currently no grouping of symptoms recognized by the medical profession as caused by wind turbines.[135]

1.223 It should also be noted that Dr McMurtry is the founder of the wind opponent group 'Society for Wind Vigilance' and owns a property 1½ kilometres from a proposed wind farm, which Dr McMurtry testified is currently before the courts.[136]

1.224 Speaking more broadly of witnesses who appeared before the committee, Labor Senators note that, of those who called on their professional expertise to argue that wind farms cause human health problems, many have a personal history of opposing wind farm developments near their own residences. Labor Senators note that this background raises questions regarding the impartiality of their evidence.

1.225 The majority report also refers to 'ground breaking work' from Dr Kelley at NASA in the 1980s in support of its claim that infrasound is leading to human health impacts.[137]

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133 Stop these Things, '21 Peer Reviewed Articles on the Adverse Health Effects of Wind Turbine Noise' stopthesethings.com/2014/12/17/21-peer-reviewed-articles-on-the-adverse-health-effects-of-wind-turbine-noise/ , accessed 2 August 2015

134 Professor Simon Chapman, Response to questions on Notice from Senator Urquhart arising from 29 June 2015 public hearing.

135 Ontario Environmental Review Tribunal Decision on Alliance to Protect Prince Edward County v. Director, Ministry of the Environment, p. 30.

136 Dr Robert McMurtry, *Committee Hansard*, 29 June 2015, p. 9.

137 Senate Select Committee on Wind Turbines, *Final Report*, August 2015, p. 23.

1.226 In response to a question on notice regarding Dr Kelley's work, the AAAC noted that:

> The NASA research referred to is the 1985 investigation of a downwind turbine known as the MOD-14.Downwind turbines are no longer used as they are known to generate significant levels of infrasound because of the impact of the tower wake on the turbine blades. Modern wind turbines are constructed with the blades forward of the tower and generate much less infrasound. There were no conclusions regarding noise and health other than that the noise caused annoyance.[138]

1.227 Dr Leventhall explained that Kelley had gone on to do work on the MOD2 wind turbine design, which followed the MOD1:

> The type of downwind wind turbine which Kelley investigated (MOD1) no longer exists. But following the MOD1 work a new design, the MOD2, was developed. This is superficially similar to modern turbines. Kelley's conclusions on the MOD2 were "We determined from our analysis of both the high- and low-frequency-range acoustic data that annoyance to the community from the 1983 configuration of the MOD-2 turbine can be considered very unlikely at distances greater than 1 km (0.6 mile) from the rotor plane."
>
> Over the 30+ years since the MOD2 was designed there have been further developments in reducing wind turbine noise and the 1km estimate will have shrunk.
>
> I do not believe that Kelley showed "sleep disturbance and annoyance symptoms which were scientifically established to be directly caused by infrasound and low frequency noise at levels well below the thresholds of human hearing" as stated in your question.[139]

Comparative health impacts of different forms of energy generation

1.228 Finally Labor Senators note that the lack of scientific evidence linking wind farms to human health effects stands in stark contrast with the well-established evidence of health harms arising from other forms of energy generation. As with other terms of reference in this inquiry, Labor Senators believe that a proper evaluation of wind power can only be reached if it is examined in comparison to other generation types.

1.229 The PHAA supported this position:

> …we submit that any potential health impacts of wind turbines need to be assessed within the broader context of the health impacts on individuals and society from all energy choices and that the broad health and energy needs

138 Association of Australian Acoustical Consultants, Answers to questions on notice arising from 10 June 2015 public hearing, p. 2.

139 Dr Geoff Leventhall, Answers to questions on notice from Senator Madigan arising from 23 June 2015 public hearing, p.2.

> of the 21st century economy and society, faced with the prospect of runaway global warming if we do not rapidly reduce greenhouse gas emissions, is as much as—we are in strife if we do not reduce our emissions as much as technologically feasible, starting as soon as possible.
>
> In this context we argue that wind turbines can make an important contribution to human health and wellbeing, which offsets the noise disturbance effects on a minority of people. The balance of evidence currently suggests that although wind turbines are not completely free of all harm to neighbouring populations, in comparison with non-renewable energy sources, particularly fossils fuels and nuclear energy, they are likely to be considerably less harmful in both the short and long term, at a population level, than these alternatives.[140]

1.230 The Climate and Health Alliance's *Health and Energy Choices: Background Briefing Paper* provides a summary of the evidence concerning the health impacts of different forms of energy generation. It documents the following impacts of fossil fuel based energy production in Australia:

> Communities across Australia are being affected by coal mining, transportation and combustion, and unconventional gas exploration and production. Communities living near proposed coal mines, coal mine expansions, coal seam and shale gas extraction potentially face displacement, water insecurity, air and noise pollution, risks to water quality, loss of amenity and social capital, and serious physiological and psychological health risks. Those being exposed to coal transport face unacceptable levels of noise and air pollution that regularly breach air quality standards. Those living in proximity to coal fired power stations face risks of respiratory, cardiovascular, neurological disease and developmental effects. Air pollution from transport kills more people each year than the road toll.[141]

1.231 A World Health Organization background document for the Fourth Ministerial Conference on Environment and Health outlined the comparative health impacts of different energy sources.

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140 Dr Peter Tait, *Committee Hansard*, 19 May 2015, p. 43.

141 Climate and Health Alliance, *Health and Energy Choices: Background Briefing Paper*, November 2014, p. 1, http://caha.org.au/wp-content/uploads/2014/11/Health-Energy-Choices-Bkgd-Briefing-Paper-201411081.pdf, accessed 24 July 2015.

Figure 1—Years of life lost from acute and chronic air pollution effects per TWh (Source CIEWAT 1998)

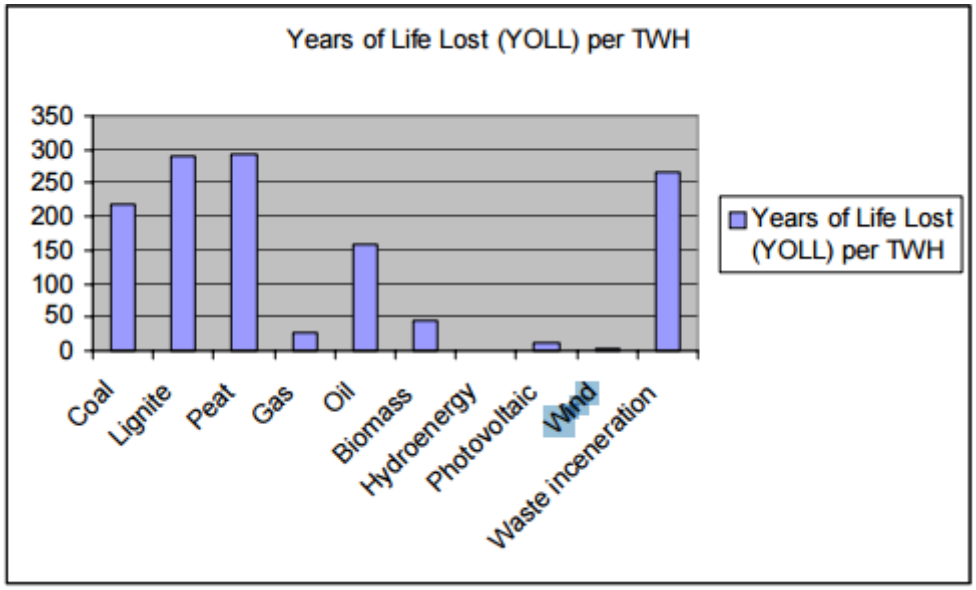
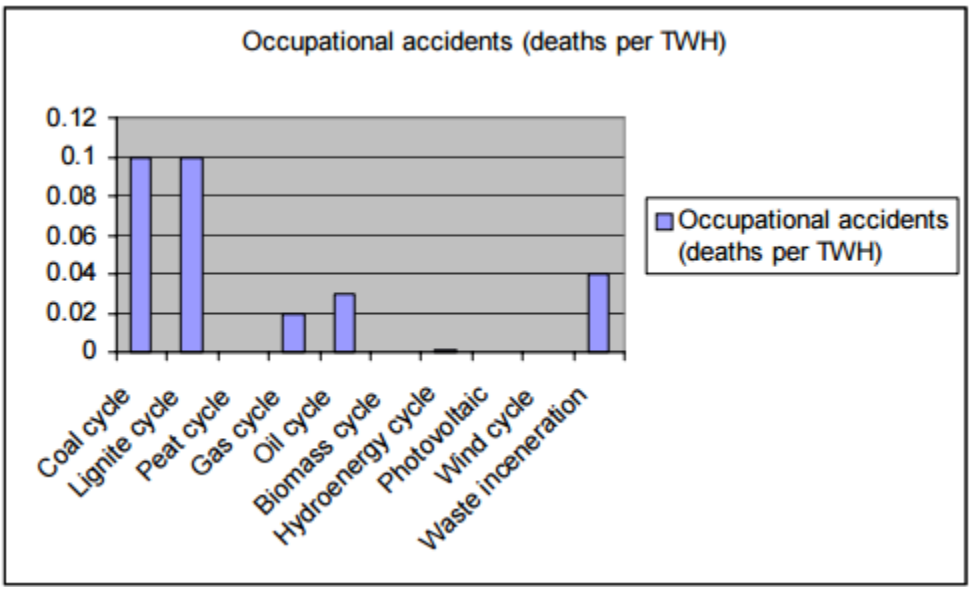


Figure 2—Occupational accidents (deaths per TWh) (CIEWAT 1998)



SOURCE: World Health Organization (2004): Energy, sustainable development and health. Background document for the Fourth Ministerial Conference on Environment and Health, 23–25 June 2004, Geneva. P.45

1.232 Labor Senators emphasise that, in light of the evidence put before the committee, the impacts of wind power on the health of the Australian community must be considered very minor in comparison to the impacts attributable to established fossil fuel generation methods. Any reasonable examination of the public health impacts of wind power must take into account this context.

(d) the implementation of planning processes in relation to wind farms, including the level of information available to prospective wind farm hosts

1.233 Labor Senators note that the Intergovernmental Panel on Climate Change (IPCC) has cited 'cumbersome and slow planning, siting and permitting procedures' as a significant challenge facing wind energy generation and noted that many countries with sizable wind resources have not deployed significant amounts of wind energy partly as a result of this factor.[142]

1.234 Labor Senators believe that recommendations contained in the committee's interim report would significantly increase the regulatory and cost burdens faced by wind farm proponents and operators in Australia by unnecessarily duplicating planning regulations concerning sound emissions. These duplication proposals extend to the establishment of both a distinct scientific advisory body to deliver exactly the service currently provided by the NHMRC and a 'national wind farm ombudsman' to provide a 'referral service' to the currently existing planning complaint regimes and ombudsmen at state and territory level. These proposals will needlessly increase the complexity of the current planning regime and impose an unjustifiable penalty on the wind industry via a proposed levy.[143]

1.235 Labor Senators emphasise that planning processes governing wind farms in Australia are primarily the responsibility of state and territory governments and should remain so. These processes fall within the broader category of land use planning and the Commonwealth Government has not generally intervened in this area of governance.

1.236 As detailed below, Labor Senators believe that the planning processes operating in state and territory jurisdictions are effective and that no evidence has been presented during this inquiry that would justify Commonwealth intervention. Furthermore, no coherent arguments have been presented which would justify Commonwealth intervention in the specific case of wind farm developments but not in the case of other energy generation developments with well-established health and environment impacts, such as coal seam gas extraction or coal mining and combustion.

1.237 Dr James Prest, Australian Centre for Environmental Law, emphasised that, whereas the states and territories and the Federal Parliament have continued to enact environment protection legislation, land use planning law has been undertaken by the states and territories. The only exceptions to this division of responsibilities have occurred where the Federal Parliament has made land use planning laws for parts of Canberra and the ACT and for external territories.[144]

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142 International Panel on Climate Change, *Renewable Energy Sources and Climate Change Mitigation*, 2011, pp. 559–560, http://srren.ipcc-wg3.de/report/IPCC_SRREN_Ch07.pdf, accessed 27 July 2015.

143 Senate Select Committee on Wind Turbines, Interim Report, June 2015, pp. 1–3.

144 Australian Centre for Environmental Law, *Submission 462*, p. 4.

1.238 It has been the generally accepted position that state and territory governments are responsible for land use planning and the planning law statutes in the eight mainland state and territory jurisdictions have been established on this basis.[145] There are also statutes governing noise limits in each of these jurisdictions.[146]

1.239 Dr Prest also emphasised that any attempt by the Commonwealth to intervene in this area would be contrary to the terms of the 1992 *Intergovernmental Agreement on the Environment*, which explicitly states that, with regard to resource assessment, land use decisions and approval processes 'The development and administration of the policy and legislative framework will remain the responsibility of the States and Local Government.'[147]

1.240 As was further argued by Dr Prest, such intervention would also be contrary to the principles of the National Review of Environmental Regulation, agreed to by Environment Ministers in 2014, in so far as such new Federal legislative provisions are 'inconsistent with or in contradiction to State laws on wind farms or indeed in conflict with the intent of existing Federal laws'.[148]

1.241 With regard to the current operation of the state and territory based planning regimes, the committee received evidence that wind farms are subject to some of the strictest regulations in the world. For example, the Clean Energy Council stated:

> Wind farms in Australia currently face among the toughest guidelines in the world in relation to their siting, operation and permissible noise levels.[149]

1.242 In its 2010 *Wind Farms Technical Paper: Environmental Noise*, consulting firm Sonus reported on the regulation of noise from wind farms in Australia:

> Australian jurisdictions presently assess the noise from wind farms under a range of Standards and Guidelines applicable to each individual State or Territory.
>
> The Standards and Guidelines used in Australia and New Zealand are stringent in comparison to other International approaches. They are also the most contemporary in the World, with recent updates and releases of the main assessment approaches occurring in both late 2009 and early 2010.[150]

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145 For a list of these statues see footnote 13 Australian Centre for Environmental Law, *Submission 462*, p. 4.

146 Australian Centre for Environmental Law, *Submission 462*, p. 8.

147 *Intergovernmental Agreement on the Environment*, 1992, schedule 2, point 4, http://www.environment.gov.au/about-us/esd/publications/intergovernmental-agreement , accessed 27 July 2015.

148 Australian Centre for Environmental Law, *Submission 462*, p. 6.

149 Clean Energy Council, *Submission 450*, p. 8.

150 Sonus, *Wind Farms Technical Paper: Environmental Noise*, November 2010, p. 4, http://www.epuron.com.au/wp-content/uploads/2011/12/dt_intfc4ef928e173cce_4ef948ee6b1b1.pdf?Noise%20-%20Sonus%20-%20Wind%20Farms%20Technical%20Paper%20-%20Nov%202010.pdf , accessed 27 July 2015.

1.243 This report also contains a summary of noise standards that are applied to wind farms in international jurisdictions and lists the common elements that applied in Australian jurisdictions at the time of publication:

- Objective standards that provide a base noise limit and a background noise related limit, with the exception of the EPHC draft Guidelines and the Australian Standard;
- A background noise and wind speed measurement procedure to determine the applicable background noise related limits at each dwelling;
- A noise level prediction methodology to enable a comparison of the predicted noise level from the wind farm against the noise limits at each dwelling;
- The required adjustments to the predicted noise levels to account for any special audible characteristics of the wind farm noise;
- A compliance checking procedure to confirm the operational wind farm achieves the predicted noise levels at each dwelling.[151]

1.244 Vestas also noted that, with reference to the 2010 Sonus report, 'it is fair to say many Australian wind farm planning regulations have become more restrictive since then. In late 2011 the NSW government released what the Planning Minister at that time called "some of the toughest windfarm guidelines in the country, possibly the world".'[152]

1.245 With regard to the regulation of sound levels from wind farms, including infrasound, state and territory planning and environment protection bodies informed the committee that they rely on the advice of the respected scientific and health advisory bodies such as the NHMRC and World Health Organisation.[153]

1.246 Labor Senators note that state and territory governments and planning bodies, as well as wind farm developers, are well aware of the need to ensure effective consultation occurs with the community in the vicinity of wind farm proposals. For example, the South Australian Government informed the committee:

> Wind farm developers recognise the need for good community consultation and spend considerable hours with their prospective communities explaining their development and fielding questions. An example of good practice in South Australia is the Trust Power Palmer Wind Farm

151 Sonus, *Wind Farms Technical Paper: Environmental Noise*, November 2010, pp. 17–18, http://www.epuron.com.au/wp-content/uploads/2011/12/dt_intfc4ef928e173cce_4ef948ee6b1b1.pdf?Noise%20-%20Sonus%20-%20Wind%20Farms%20Technical%20Paper%20-%20Nov%202010.pdf , accessed 27 July 2015.

152 Vestas, Answers to questions on notice arising from 9 June public hearing, p. [3].

153 For example, see Mr Greg Chemello, *Committee Hansard*, 18 May 2015, p. 21; Mr John Ginivan, *Committee Hansard*, 9 June 2015, pp 8–9; Mr Peter Dolan, *Committee Hansard*, 29 June 2015, p. 12.

> development. The company sends regular newsletters to stakeholders, has undertaken community meetings and employed a community liaison person who lives in the local area to assist with information dissemination. They have developed the concept of neighbourhood agreements whereby non-host residents who live nearby a wind farm, but who are not hosts, can benefit financially from the development.[154]

1.247 The ACT Government emphasised that it views engagement with the local community as pivotal to 'delivering best wind farm outcomes.' To ensure this occurs for wind farms projects it supports, the ACT Government has:

> …committed to the implementation of good community engagement practices by renewable energy industries. A major part of this commitment has been a significant community engagement evaluation criterion that was incorporated into the assessment of proposals submitted to the ACT's 2014/2015 wind auction.[155]

1.248 The Clean Energy Council stated that wind proponents in Australia:

> …engage a range of stakeholders at early stages of feasibility to determine environmental, cultural or amenity impacts in addition to those identified in the formal environmental assessment process that need to be understood and managed as part of the development.
>
> These stakeholders include landowners; the local community; experts in noise, landscape and visual impacts, aviation, electromagnetic interference and heritage; the Civil Aviation Safety Authority (CASA); Network Service Providers; electricity retailers; indigenous groups and other specific interest groups including groups advocating in relation to local fauna or flora.[156]

1.249 The Clean Energy Council also highlighted several outstanding examples of ongoing community engagement at Windlab's Coonooer Bridge wind farm and Infigen's Flyers Creek wind farm. They noted:

> The wind industry is not complacent about the strong political and community support it receives and therefore continues to reflect and innovate on the ways it interacts, engages and supports local communities. A wind farm is part of a community for 20 years or more. History shows that projects inject substantial direct and indirect economic benefits to these communities both during the construction and ongoing operational phase of the wind farm. The wind sector is continuing to explore and implement different models for sharing the benefits these projects bring.[157]

1.250 Infigen Energy reported on its engagement with local communities and stated that it financially supports landowners to seek legal advice from a practitioner of their own choosing before entering into agreements with the company:

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154 South Australian Government, *Submission 59*, p. 7.

155 ACT Government, *Submission 12*, p. [2].

156 Clean Energy Council, *Submission 450*, p. 8.

157 Clean Energy Council, Answers to questions on notice arising from 9 June 2015 public hearing, p. 2.

> Infigen Energy provides prospective landowners in their development projects with extensive information on all aspects of wind farms, answers any questions the landowners may have, offers tours of existing wind farms, and encourages landowners to seek their own legal advice before signing lease agreements. If the landowners desire it, Infigen Energy pays the full cost of these legal services.
>
> We are an industry leader that aims to fully inform communities about operational and proposed wind farm sites. We contend that empowering and informing the communities near our wind farms is one of the more important issues facing the wind industry today. This applies equally to neighbours to the project as well as the landowners hosting wind turbines.[158]

1.251 With regard to the Flyers Creek wind farm development mentioned above, Infigen Energy stated that it had initiated a community renewable energy cooperative, which offers the local community the opportunity 'to invest in, and profit from, the Flyers Creek wind farm after it is constructed.'[159]

1.252 AGL outlined its approach to community engagement, including the establishment of community consultative committees and the operation of community funds, as follows:

> AGL establishes Community Consultative Committees (CCCs) early in the wind farm development process, which continue throughout the development and construction phases. Once projects are operational, ongoing community engagement takes various forms depending on the project, such as continued CCC's or the establishment of local renewable energy information centres (as AGL has done at Burra, near the Hallett wind farms in South Australia). AGL participates in regular CCC meetings in each of the communities in which its wind farms are located or proposed.
>
> The CCC brings together key representatives of the local community to provide an opportunity to raise questions, voice concerns, build relationships and to provide a forum for AGL to communicate with communities about its operations. Local Council participation is essential in instilling community confidence in wind energy and the planning process, and for all projects AGL seeks to collaborate closely with local Councils which form a key part of CCC deliberations. To balance community welfare and investor confidence, AGL considers that robust Council and community engagement, such as a CCC, should be a requirement of all wind energy project developments.
>
> AGL also contributes to the communities neighbouring its wind farm projects on an ongoing basis, and will do so for the life of the projects. AGL is proud to contribute to the infrastructure and wellbeing of these communities. For example, in the 12 months to June 2014:

158 Infigen Energy, *Submission 425*, p. 11.

159 Infigen Energy, *Submission 425*, p. 11.

- The Macarthur Wind Farm Community Fund donated $50,000 to a range of community organisations, including for sporting facilities, health equipment and venue upgrades. An additional $40,000 was provided as a sponsorship for local firefighting vehicles, and $12,500 in sponsorship was provided to local students for educational travel.
- The AGL Wattle Point Wind Farm Community Fund donated $15,000 to local community, sporting and business groups.
- The Hallett Wind Farm Community Fund donated $33,000 for local health and conservation campaigns, and for the upgrade of community facilities and sporting grounds.

AGL's experience is that community contributions work well if they are negotiated with local Councils or community groups to reflect their specific needs.[160]

1.253 RATCH-Australia reported a similar commitment to extensive community engagement, including ensuring prospective turbine hosts are fully informed before making any decisions:

As a developer of new wind farms, RAC has had dealings with numerous private landholders who are prospective wind farm hosts. RAC is very keen to ensure that any prospective hosts are able to make a fully informed decision about hosting wind turbines, and has undertaken a range of teaching/explaining activities for the prospective hosts, including:

- Taking prospective hosts on tours of existing wind farms and introducing them to other hosts and prospective hosts
- Facilitating information sharing between prospective co-hosts, making sure they are all talking to each other and sharing their thoughts and concerns with the project group
- Funding independent legal advice for prospective hosts on land leases
- Funding independent expert reviews of studies we have undertaken[161]

1.254 The Australian Wind Alliance reported:

Local matters around individual projects are routinely and expertly handled by existing state and local planning processes.[162]

1.255 The Australian Wind Alliance was, however, concerned that planning processes, specifically public planning hearings, have been the subject of disruption by anti-wind groups. It highlighted the case of a recent hearing undertaken on the Crookwell 3 project in New South Wales, at which one of its representatives had

160 AGL, *Submission 83,* p. 4.

161 RATCH-Australia Corporation, *Submission 116,* p. [2].

162 Australian Wind Alliance, *Submission 443*, p. [5].

attempted to address the meeting but was 'verbally and then physically intimidated by those in attendance', many of whom were not in fact local residents.[163]

1.256 The committee also received evidence that state and territory governments have been very active in updating their planning frameworks and in developing tools to improve planning processes for both local communities and proponents.

1.257 Labor Senators note that the Clean Energy Council has also published the *Community Engagement Guidelines for the Australian Wind Industry*. This document was developed by the Australian Centre for Corporate Social Responsibility and was sponsored by AGL, Acciona, Goldwind, Hydro Tasmania, Infigen, Pacific Hydro, Vestas, RATCH-Australia and REpower.[164]

1.258 The guidelines note that the full potential of wind farms to assist Australia to meet its emissions reductions targets as well as to bring economic benefits to local communities can only be realised with effective community engagement. In order to encourage such engagement, the guidelines are:

> …designed to be a blueprint for the Australian wind industry to engage with those communities. It sets out the recommended steps to delivering a wind farm project while maintaining the support and respect of the community.[165]

1.259 Labor Senators encourage all wind farm proponents and operators to implement these guidelines and also encourage state and territory jurisdictions to consider codifying them in their respective planning regimes.

1.260 Labor Senators note that information presented to the committee on the number of complaints made regarding wind farms indicates that very few people have been motivated to take this course of action when compared to the size of the populations that live in the vicinity of these developments.

1.261 As discussed under term of reference (c), Professor Simon Chapman has undertaken research on the pattern of complaints about Australian wind farms on the basis of noise or health effects and has demonstrated that 64.7 per cent of all wind farms have never been the subject of any complaints, even though there are an estimated 21,633 people living within five kilometres of these facilities. This research also concluded that a total of only 129 individuals had ever made a complaint, with 73

163 Australian Wind Alliance, *Submission 443*, pp [5–6].

164 Clean Energy Council, 'Community Engagement Guidelines for the Australian Wind Industry', http://www.cleanenergycouncil.org.au/technologies/wind-energy/community-engagement-guidelines.html, accessed 27 July 2015.

165 Clean Energy Council, 'Community Engagement Guidelines for the Australian Wind Industry', foreword, http://www.cleanenergycouncil.org.au/technologies/wind-energy/community-engagement-guidelines.html, accessed 27 July 2015.

per cent of these complainants being residents near six wind farms 'targeted by anti wind farm groups.'[166]

1.262 The relatively small number of complaints, and their uneven distribution, was recognised by the Victorian Department of Environment, Land, Water and Planning which informed the committee that

> Indications are that complaints about potential health impacts appear to be related to a limited number of project sites[167]..

1.263 That wind farms generate very few complaints from a very small minority of residents was further confirmed by information provided by the Glenelg Shire Council. The committee was informed that, of the approximately 11,000–12,000 residents living within a five kilometre radius of a wind farm in the Shire of Glenelg:

> Council is aware of six people (from three families) who have made written complaints about existing built wind farms. Further complaints from two people were received about Stage 4 of the Portland Wind Farm prior to its construction.[168]

1.264 Finally, Labor Senators note that the committee received some evidence of dissatisfaction with the distribution of responsibilities between state and local governments regarding the assessment of development applications and the monitoring of planning conditions after a project is approved.[169]

1.265 Labor Senators note that the difficulty in such cases appears to be that local governments feel they lack the expertise and resources required to properly assess wind proposals against the detailed technical requirements of the planning regimes governing wind farms in each jurisdiction.

1.266 While noting that the delegation of planning responsibility to local governments is a matter for each state jurisdiction, Labor Senators encourage state governments to provide government bodies involved in their respective planning regimes with sufficient resources to carry out their tasks, whether they be at the state or local level, and to locate approval and monitoring tasks with bodies best equipped to carry them out.

1.267 Labor Senators note that the Victorian Government has recently moved to relieve local councils of the responsibility for determining planning permit

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166 Simon Chapman, Alexis St George, Karen Waller, Vince Cakic, '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*, 16 October 2013, http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0076584

167 Victorian Department of Environment, Land, Water and Planning, Answers to questions on notice arising from the 9 June public hearing, p.3.

168 Glenelg Shire Council, Answers to questions taken on notice during 30 March public hearing, p. 1.

169 For examples of this position see evidence provided by representatives of the Glenelg Shire Council, Ararat Rural City Council and Pyrenees Shire Council, *Committee Hansard*, 30 March 2015, pp 32–39.

applications for wind farms and to make the Minister for Planning the decision maker for all new permit applications.[170]

1.268 The Queensland Government also submitted that it intends to change the way wind farm developments are assessed. It noted that local governments are currently the assessing authorities for wind farm developments against their local planning schemes, however:

> …the majority of planning schemes do not include specific provisions for wind farms and many councils do not have the capacity or resources to effectively assess these highly technical applications.
>
> Future applications for wind farm development are to assessed by the State Assessment and Referral Agency…[171]

1.269 In conclusion, Labor Senators believe evidence provided to the committee demonstrates that wind farm developments in Australia are currently subject to very strict regulation, both when compared to other industries and when compared to wind farm regulation in other countries. These regulations are shaped, as they should be, by scientific and medical advice from the NHMRC. Labor Senators emphasise that wind farms have generated a very low rate of complaints to date and believe that the strict regulations in place have contributed to this outcome.

1.270 Labor Senators also note that both state governments and wind farm proponents are very aware of the important role community consultation plays in the successful establishment of wind farms. Evidence before the committee suggests that consultation is already extensive and that both proponents and governments are working to improve processes wherever possible. Labor Senators support this process of ongoing improvement and highlight the best practice examples discussed above.

1.271 Labor Senators do not believe any case has been made for a wind farm-specific intervention in the land use planning regimes of the states and territories by the Federal Government. The current arrangements are long-standing and successful and the states and territories have demonstrated they are responding where necessary to address pressures that arise from the technical nature of wind farm planning assessments.

170 Department of Economic Development, Jobs, Transport and Resources, *Submission 112*, p. 4.

171 Queensland Government, *Submission 413*, p. 2.

(e) the adequacy of monitoring and compliance governance of wind farms

1.272 The 2012 report of the Senate Environment and Communications Legislation Committee on the Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012, found with regard to noise regulation of wind farms:

> The committee has seen evidence of adequate compliance mechanisms and audit processes in place, and acknowledges the work of state governments in strengthening aspects of these processes over the last three years.[172]

1.273 Labor Senators do not believe any significant areas of concern have arisen since this time. Evidence presented to this inquiry suggests monitoring and compliance mechanisms with regard to noise and other aspects of wind farms are being effectively managed by state and territory bodies.

1.274 The Department of the Environment noted that primary responsibility of monitoring and compliance of wind farms falls to the states and territories, but that the Commonwealth has a limited role in monitoring projects that have been approved under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These activities are determined by the department's Annual Monitoring and Compliance Plan, and cover only those activities relevant to the EPBC Act.[173]

1.275 As detailed in discussion under term of reference (b), the CER monitors compliance of wind farms with Commonwealth, state and territory regulations, but does not itself make determinations about compliance.[174]

1.276 The Clean Energy Council summarised the monitoring and compliance requirements currently affecting wind farm developers and operators as follows:

> Wind farm projects adhere to specific technical compliance regulations. In order to apply for a development permit the wind farm developer must undertake various technical measurement, analysis and modeling and submit it for approval. Once approved, wind farm owners are required to supply further information to the regulator (usually the state government) which has experts who undertake the compliance analysis.[175]

1.277 The South Australian Government submitted that it believes the wind farm industry is well regulated and that it has only found one case of marginal non-compliance in the 12-year history of the industry, a matter which was rectified promptly by the operator:

> In South Australia, a wind farm developer needs to abide with specific compliance hurdles in order to be operational, and these requirements have led to a well regulated industry. Compliance is required for a change in land use, connection to the grid, generation, and noise.

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172 Senate Environment and Communications Legislation Committee, *Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012*, November 2012, p. 42.

173 Department of the Environment, *Submission 358*, p. 9.

174 Department of the Environment, *Submission 358*, p. 9.

175 Clean Energy Council, *Submission 450*, p. 8.

> Planning approval is required for a change in land use, which includes compliance with the EPA noise guidelines. Before developing the site, the proponent is typically required to monitor background noise. Once commissioned, further monitoring is required to ensure the wind farm operates within the noise guidelines.
>
> This system is proven to be sufficiently robust. During 12 years of wind industry history in South Australia, there was only one case of marginal non-compliance linked to the temporary presence of tones in wind farm noise. This issue was rectified by the wind farm owner in an efficient and timely manner.[176]

1.278 The Victorian Department of Economic Development, Jobs, Transport and Resources noted that the compliance of wind farms with noise standards attracted the most interest. In Victoria planning approvals require new wind farms to meet New Zealand Standard 6808:2010, Acoustics – Wind Farm Noise, and older wind farms to meet the 1998 version of this standard. The department provided the following details about compliance processes:

> Planning permit conditions require operators to undertake monitoring and demonstrate compliance with the New Zealand Standard following completion of construction. The specific conditions of each permit vary in their wording but generally a final compliance report must be submitted after a 12 month testing period following the commencement of full operation of a facility. These reports can be peer reviewed by the responsible authority. Following this review, if the facility is deemed to be operating in accordance with the permit requirements regarding noise, the responsible authority will advise the proponent.
>
> All wind farm permits require the proponent to develop a noise complaints evaluation procedure to address complaints or possible noise compliance issues. When the model permit conditions from DELWP's guidelines are used, they include provisions where the responsible authority can require the initiation of additional noise testing at the cost of the wind farm operator.
>
> The Victorian Government has been refining the wind farm guidelines and the model wind farm permit conditions since their introduction. Some older permits for wind farms do not have the ability to compel operators to undertake further testing. In these instances further acoustic testing could be undertaken by the council if warranted to address specific issues or concerns.[177]

1.279 The draft *NSW Planning Guidelines: Wind Farms* indicate that similar requirements are placed on wind farms developers in that state:

> A number of requirements will be applied regarding auditing and compliance particularly in relation to noise including:

176 South Australian Government, *Submission 59*, p. 8.

177 Department of Economic Development, Jobs, Transport and Resources, *Submission 112*, p. 5.

- Conditions of consent will require the applicant to prepare and submit a Noise Compliance Report within 12 months of the commencement of operation of the wind farm
- Noise monitoring must be undertaken during 'worst case' periods (which would include during any temperature inversions).
- Special audible characteristics such as excessive amplitude modulation (including the van den Berg effect) together with cumulative impacts must also be considered.
- The proponent must make the noise compliance report publicly available.
- Neighbour can write to the Director General of the Department of Planning and Infrastructure to request independent noise monitoring at their house.[178]

1.280 In response to complaints from residents about noise and other issues the New South Wales Government has conducted a compliance audit of wind farms. This audit was completed in 2013 and included the Cullerin Range, Capital and Woodlawn wind farms. This audit included an independent acoustic expert taking measurements at nearby residential properties. The audit concluded that 'all three wind farms were compliant with their noise-related approval conditions.' The audit did identify breaches of a number of other conditions which have since been rectified by operators.[179]

1.281 The South Australian Environment Protection Authority has also conducted additional studies to address concerns of residents regarding sound emissions from wind farms, despite such farms demonstrating compliance with their development approval conditions via the standard post-construction noise monitoring.

1.282 Mr Peter Dolan of the South Australian Environment Protection Authority described the work his organisation undertook to investigate the sound emissions of the Waterloo wind farm in response to repeated complaints:

> We did an extensive study at Waterloo over two months in six houses from zero to 20,000 hertz. We investigated this in detail because a group of concerned citizens came to us and convinced me that we needed to do more work to understand this. We were able to arrange for six shutdowns of the complete station whilst our equipment was still running during periods of generation—so what we would consider peak times for noise generation. We did however select the sites that we monitored based on complaints—there were folk who had complained previously about the wind farm—and that was based on the assumption that if that is truly concerning them we

178 NSW Department of Planning and Infrastructure, *NSW Planning Guidelines: Wind Farms (draft for consultation)*, December 2011, p. 7, http://www.planning.nsw.gov.au/Portals/0/PolicyAndLegislation/NSW_Wind_Farm_Guidelines_Web_Dec2011.pdf, accessed 28 July 2015.

179 NSW Government, 'Wind farms meet noise limits, breach other conditions', Media Release, 6 December 2013, http://www.planning.nsw.gov.au/wind-farms-audit, accessed 28 July 2015.

> should be able to find something. We did not. In fact, I was quite surprised at how certain the results were. At several of the sites the wind farm was not detectable at all.
>
> At several sites residents who had filled out a diary for us recorded concerns about the wind farm when the wind farm was most definitely off. We continuously monitored throughout the period of the shutdown, before and after, and we made sure that we only used data where we had had operating machines going for at least two hours prior to and two hours after to see what contribution the wind farm made to entire spectrum, including infrasound. They clearly contribute but at no time did they exceed the South Australian guidelines during that period. In some sites you could not notice the difference in noise or sound whether the wind farm was operating or not. So, based on that study, we do not believe there is a need to change our guidelines, other than some tidy up.[180]

1.283 Pacific Hydro provided the following summary of compliance measures wind farm developers must meet:

> Approval of a wind farm requires that a wind farm developer prepare in-depth technical measurements, analysis and modelling which must be approved by the relevant regulator(s). Following the granting of an approval, the wind farm operator must ensure compliance with the various conditions of the approval, which includes the ongoing provision of technical measurements and analysis to regulators, who undertake compliance analysis.[181]

1.284 Labor Senators note that some wind farm operators have undertaken studies beyond those required under planning regulations in order to address community concerns. A prominent example of such work is the study conducted by Mr Steven Cooper at Pacific Hydro's Cape Bridgewater wind farm. This study was commissioned by Pacific Hydro in order to investigate disturbances reported by residents in three households.

1.285 As discussed under term of reference (c), the author of this report agreed with the operator that the report did not justify any change to the regulatory regime. Labor Senators also note that the Cape Bridgewater facility has already been found to comply with its permit conditions and applaud Pacific Hydro for its efforts in investigating this matter further.[182]

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180 Mr Peter Dolan, *Committee Hansard*, 29 June 2015, p. 15; see also South Australian Environment Protection Authority, 'Waterloo Wind Farm Environmental Noise Study', http://www.epa.sa.gov.au/environmental_info/noise/types_of_noise/wind_farms/waterloo_wind_farm_environmental_noise_study , accessed 28 July 2015.

181 Pacific Hydro, *Submission 419*, p. 18.

182 Pacific Hydro and The Acoustic Group, 'Joint Statement', 16 February 2015, http://www.pacifichydro.com.au/files/2015/02/Pacific-Hydro-The-Acoustic-Group-Joint-statement-16-February.pdf, accessed 29 July 2015.

1.286 The inquiry also received evidence of wind farm operators carrying out ongoing bird and bat monitoring at their wind farms. For example, Trustpower provided the following information on its Snowtown wind farm:

> Trustpower has a contractual requirement with our services providers that manages the respective Stage 1 and Stage 2 of our Snowtown Wind Farm to look for and report any bird strikes. We also had a specific annual Wedge Tail Eagle nesting monitoring plan for both stages of the wind farm, which has now been completed. The monitoring programme has identified successful annual wedge tail eagle breeding on site during the construction and operating of the wind farms and a total of 2 wedge tail eagle mortalities since commencement of operation in 2008.[183]

1.287 AGL also stated that it undertakes regular monitoring of bat and bird mortality at its wind farms, and provided the following information regarding the Macarthur wind farm:

> Where required by planning permits, AGL undertakes monitoring programs to estimate the frequency of bird and bat deaths as a result of collision with wind turbines. In the first 12 months of monitoring at the Macarthur Wind Farm, an estimated mortality rate of 1.3 birds per turbine per year was observed, as well as 0.1 bats per turbine per year. Importantly, the effects on threatened species were found to be negligible, and no collisions with the primary avian species of concern at the site (brolga) were observed.[184]

1.288 Labor Senators believe that evidence presented to the committee indicates that state and territory governments have implemented effective regimes for undertaking monitoring and enforcing compliance.

1.289 With regard to the issue of compliance with noise limits imposed by planning regimes, it appears state bodies have been very active in responding to community concerns. In addition to the post construction noise monitoring that takes place at each wind farm development, state bodies such as the NSW Department of Planning and Infrastructure and the South Australian Environment Protection Authority have undertaken further investigations where repeated complaints have been received. In these cases, the wind farms have again been found to be compliant.

1.290 Labor Senators do not believe any case has been made that the compliance and monitoring regimes of the states and territories are systemically flawed.

1.291 As discussed under term of reference (d) the distribution of responsibilities and resources between state and local governments may be a point of weakness in current arrangements. The Australian Wind Alliance noted a number of matters with regard to compliance monitoring that could be addressed in future reforms:

> Compliance of wind farms with applicable regulations is in many cases devolved to the local council level, who are often under resourced and lack the appropriate skill base to execute this work properly.

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183 Trustpower, Answers to questions on notice arising from 10 June public hearing, p. [2].

184 AGL, *Submission 83*, p. 6.

> Postconstruction noise monitoring is generally done by acoustic consultants retained by the developer. Submission 111 to this Inquiry from Glenelg Shire Council has suggested that postconstruction and ongoing monitoring work be done at arms' length from developers.
>
> AWA sees merit in this idea and would welcome it as a way to increase the community's trust in the process.[185]

1.292 Labor Senators recognise the very significant resource pressures facing local councils and the additional cost burden imposed when they are forced to retain outside expertise to inform decision making and to conduct monitoring and compliance work. Labor Senators encourage state governments to work with councils to determine the best way to reduce these pressures. The committee heard evidence from the Municipal Association of Victoria that it is currently negotiating to gain access to the acoustic expertise of the EPA.[186] Labor Senators applaud this work and encourage further collaboration of this nature.

1.293 Labor Senators do not question the professionalism, nor the quality, of advice that has been provided by acoustic consulting firms that have worked on post-construction and ongoing compliance work to date. The weight of evidence provided to the committee is that there has been no impact on the independence of the work completed or the advice provided. However, Labor Senators recognise that the perception of independence within the community is also important and note that change in this area may serve to ease concerns that some individuals may have and instil broader community confidence in the system.

185 Australian Wind Alliance, *Submission 443*, p. 6.

186 Municipal Association of Victoria, *Committee Hansard*, 9 June 2015, p. 54.

(f) the application and integrity of national wind farm guidelines

1.294 Labor Senators note that, as there are currently no national wind farm guidelines in place, it is not possible to comment on their application or integrity. A document entitled *National Wind Farm Development Guidelines–draft* does exist, but it has never progressed beyond the draft stage. The history of this draft document is outlined below.

1.295 Dr Prest of the Centre for Environmental Law submitted that Commonwealth regulation of wind farm projects was first suggested in 2006 by former Environment Minister, Senator Ian Campbell, in the form of a 'code of practice for wind projects', as a means of justifying 'intervention in local planning matters in the proposals for wind farms at Denmark (WA) and Bald Hills (Vic).'[187]

1.296 The code of practice was replaced by the idea of a set of guidelines, following a change of government at the federal level. These guidelines were developed by the Environment Protection and Heritage Council (EPHC), a body established by COAG to address national policy issues regarding environmental protection. As noted by Dr Prest, a 2008 report by the EPHC, *Impediments to Environmentally and Socially Responsible Wind Farm Development*, included the following rationale for national guidelines:

> The Working Group agreed that the assessment and approval systems in jurisdictions are generally robust and working well, and that many issues identified in this report are being adequately dealt with through existing processes.
>
> …
>
> However, the Working Group concluded that there is merit in developing government-endorsed National Wind Farm Development Guidelines to deliver a higher degree of consistency and transparency in the planning, assessment, approval and environmental monitoring of wind farms. These Guidelines would assist in building community acceptance and support for wind energy developments.[188]

1.297 This report also noted that the best practice model embodied by the guidelines 'is preferred because it can provide greater national consistency in how the matters it covers are addressed and can be readily incorporated into jurisdictions' existing regulatory practice without the need for amendments to statutory schemes.' The previous code proposal was considered the 'less preferred approach because it would be viewed as having its own legal basis and the working group does not believe there

187 Dr James Prest, *Submission 462*, p. 11.

188 Environment Protection and Heritage Council, *Report on Impediments to Environmentally and Socially Responsible Wind Farm Development*, November 2008, p. 5, http://www.scew.gov.au/system/files/resources/afb015f4-8b55-6904-716c-d26bcf317c86/files/ephc-wind-farm-dev-report.pdf, accessed 28 July 2015.

is a compelling rationale for a mandatory approach, ie, the existing regulatory arrangements are effective.'[189]

1.298 In 2009 the EPHC directed officials to develop such national wind farm development guidelines, a draft version of which was released for public consultation in July 2010. The Department of the Environment described the content and intended use of these guidelines:

> The draft Guidelines outlined best-practice for industry and planning authorities, promoting a higher degree of consistency and transparency in the planning, assessment, approval and monitoring of wind farms across jurisdictions. The draft Guidelines included key principles for consideration, addressing a range of issues which are unique or significant to wind farm development and operation: community and stakeholder consultation; wind turbine noise; visual and landscape impacts; impact on birds and bats; shadow flicker; and electromagnetic interference. The draft Guidelines were not mandatory, nor did they seek to change existing jurisdictional statutory processes.[190]

1.299 The EPHC ceased further development of the draft guidelines because jurisdictions did not consider them necessary and stakeholders believed that they 'added complexity and involved the Commonwealth in an area for which it was not the responsible authority.'[191]

1.300 The 2011 Senate Community Affairs References Committee inquiry into the social and economic impact of rural wind farms recommended that the draft guidelines be updated.[192] The then federal government did not act on this recommendation, having decided that the draft guidelines remained unnecessary.[193] No further work has taken place on these draft guidelines since 2011.

1.301 The Clean Energy Council stated in its submission that national guidelines are not needed as each jurisdiction has guidelines adapted to their unique circumstances:

> Every Australian state government has planning guidelines that are best suited to the unique requirements of its community, industry, and land use configurations. Planning rules for wind farms (and for any other major project) must simultaneously consider various technical issues and social

189 Environment Protection and Heritage Council, *Report on Impediments to Environmentally and Socially Responsible Wind Farm Development*, November 2008, p. 6, http://www.scew.gov.au/system/files/resources/afb015f4-8b55-6904-716c-d26bcf317c86/files/ephc-wind-farm-dev-report.pdf, accessed 28 July 2015.

190 Department of the Environment, *Submission 358*, p. 10.

191 Department of the Environment, *Submission 358*, p. 10. A more detailed account of criticisms of the draft guidelines can be found at Senate Community Affairs References Committee, *The Social and Economic Impact of Rural Wind Farms*, June 2011, pp 46–49.

192 Senate Community Affairs References Committee, *The Social and Economic Impact of Rural Wind Farms*, June 2011, p. 49.

193 Department of the Environment, *Submission 358*, p. 10.

> issues. State governments should be left to design wind farm planning requirements as a part of a broader planning regime.[194]

1.302 The South Australian Government expressed a similar view and commented on the last iteration of the draft guidelines:

> The South Australian Government is not supportive of national wind farm guidelines due to the particular nature of each state, and the individual differences in planning system regimes. The latest version of the Draft National Wind Farm Guidelines included controversial recommendations which South Australia did not support and further work on the Guidelines was stalled due to a change of priorities at the Federal level.[195]

1.303 The Victorian Department of Economic Development, Jobs, Transport and Resources expressed a more positive view on the draft guidelines and noted some areas where further refinements might be made, but also emphasised their status as a useful resource rather than a mandatory requirement:

> The draft national wind farm guidelines are a useful resource for developers, decision makers and communities. The guidelines acknowledge that each state has its own planning controls and regulation. They provide detailed information on the matters considered when determining permit applications. The guidelines are referenced in the Victorian wind farm guidelines.
>
> The Victorian Government considers the national guidelines to be an appropriate tool having regard to Victorian legislation. Further refinements may be considered with regard to the 1 km consent zone around turbines, EPA auditors, and enforcement.[196]

1.304 Labor Senators note that the project to develop national guidelines was undertaken on the explicit basis that they were not intended to have a legal status in their own right and that they were not intended to require amendments to statutory schemes. These guidelines have remained in draft form and, although some jurisdictions have found them useful, others disagree with their content and do not support their further development.

1.305 Labor Senators note that the proposal put forward in recommendation 3 of the committee's interim report effectively calls for a return to the mandatory 'code of practice' approach first raised in 2006. By supporting this approach, the committee majority has in effect called for a Commonwealth takeover of planning and environment regulation governing wind farms. This recommendation states that revived national wind farm guidelines should be codified by the Commonwealth and that state and territory jurisdictions should alter their planning and environment statutes to conform with them.[197]

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194 Clean Energy Council, *Submission 450*, p. 9.

195 South Australian Government, *Submission 59*, p. 9.

196 Department of Economic Development, Jobs, Transport and Resources, *Submission 112*, p. 6.

197 Senate Select Committee on Wind Turbines, *Interim Report*, June 2015.

1.306 No case has been made that state and territory planning regimes are not adequately addressing the development and operation of wind farms. In fact, the opposite appears to be true, with evidence suggesting that a very small proportion of the population living in proximity to wind farms have ever registered complaints and that state jurisdictions have been actively updating planning arrangements and producing best-practice guidelines in the period since the national wind farm guidelines project was abandoned. As argued under term of reference (d), Labor Senators strongly oppose this attempt to impose additional levels of federal regulation on a specific industry.

1.307 While Labor Senators note that the committee has listed in its interim report a number of matters on which the proposed new national guidelines must set minimum standards, it has made no comment on how these standards will be formulated, nor any specific comment on how current regulation of these areas is failing. It is therefore unclear how these guidelines are expected to differ from those currently in place in each jurisdiction and, if they are to differ, on the basis of what evidence and advice this will be determined.

1.308 Finally, Labor Senators note that media reports indicate that, despite this committee not yet delivering its final report, the federal government has already made an attempt to introduce a national wind farm sound measure in the *Environment Protection and Heritage Council Act 1994*, and to implement new national wind farm guidelines that include minimum standards.

1.309 These proposals were reportedly put to a meeting of Commonwealth, state and territory environment ministers on 14 July 2015, but were rejected by state ministers. It was reported that:

> …the states rejected the measures. State ministers asked Hunt four times if he planned to impose the same guidelines for coal, but he said no each time.
>
> One of the states also attempted to have the details of the rejection of the wind farm sound measures included in the communique, but the federal government kiboshed the attempt.
>
> A spokesperson for Hunt did not respond to *Crikey*'s questions by deadline.
>
> A spokesperson for Victorian Environment Minister Lisa Neville told *Crikey* in a statement that the push was rejected by the states because the concerns raised by the Senate inquiry had been "widely rejected by scientific and medical opinion".
>
> "The opened proposal wanted minimum standards dealing with compliance obligations, turbine noise, and more regulations regarding consultation. Victoria opposed these changes," the spokesperson said.[198]

1.310 Labor Senators are also firmly of the view that there is no compelling case for Commonwealth intervention in this area. Criticism of current arrangements stems

198 Josh Taylor, 'Gone with the wind farms: govt moves to fetter renewables, states say no', *Crikey Insider*, 21 July 2015.

overwhelmingly from those who accept claims of negative health and environmental impacts that have been repeatedly demonstrated to have no scientific foundation.

(g) the effect that wind towers have on fauna and aerial operations around turbines, including firefighting and crop management

1.311 Labor Senators note that any development activity will have some impact on fauna. Wind farms are no exception to this general rule. However, evidence presented to the committee demonstrates that the impact of wind farms on birds and other animals is extremely small when compared to that of other human activities and that any impacts are generally the subject of considerable scrutiny and mitigation activity, both prior to and after construction.

1.312 The regulation of environmental impacts for wind farm developments is primarily managed at the state level. However, the federal government also plays a regulatory role in cases where a development will have or is likely to have an impact on a matter of national environmental significance. In such cases, the approval of the Minister for the Environment is required under the EPBC Act.[199]

1.313 The Clean Energy Council provided the following summary of how wind farm developers and operators address the environmental impacts of their projects:

> Before a wind farm is constructed, project proponents conduct extensive surveys over a number of years to assess the potential impact a particular wind farm could have on surrounding flora, vegetation, soil and fauna, including birds and bats. Many wind farm operators are required to implement a monitoring program during key times such as migration or breeding to oversee potential issues.
>
> If threatened or endangered birds and bat species live around or migrate through a wind farm, very stringent regulation applies to ensure that any impacts are minimal. During wind farm design, detailed mitigation and monitoring measures are utilised to minimise the impact on fauna species surrounding the site.
>
> Bird and bat monitoring after construction is becoming routine practise both in Australia and overseas. There are no consistent standards in Australia for undertaking monitoring and most plans are developed with consultants and local regulators as part of the bat and avifauna management (BAM) plan for the wind farm.[200]

1.314 The committee was presented with evidence to the effect that bird deaths attributable to wind farms form an extremely small proportion of overall bird deaths resulting from human activity. Several submissions cited published estimates that wind turbines account for fewer than 1 in 10,000 bird deaths from anthropogenic causes, with buildings, power lines, cats, vehicles and pesticides posing far greater risks.[201]

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199 Department of the Environment, *Submission 358*, p. 7.

200 Clean Energy Council, *Submission 450*, p. 9.

201 Clean Energy Council, *Submission 450*, p. 10; Infigen, *Submission 425*, pp 13–14; Ms Emma Bennett, *Submission 267*, p. [1]; Wallace Erickson, Gregory Johnson and David Young Jr, 'A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions', tabled by Ms Emma Bennett at 9 June 2015 public hearing.

1.315 Environment Victoria highlighted two further sources of information from North America. The 2014 State of the Birds report attributed 250,000 bird deaths per year to wind turbines in comparison to 2.6 billion attributed to cats and 620 million attributed to collisions with buildings. A further comparison of deaths caused by wind turbines and deaths caused by other electricity generation sources found 'coal-fired power stations are responsible for 35 times more bird deaths than wind turbines. Coal is responsible for 42% of US electricity generation, with all renewables at 12%, so the discrepancy in mortality is not a function of how much more coal power there is.'[202]

1.316 The South Australian Government confirmed that wind farm proponents must conduct surveys to ascertain any possible impacts on flora and fauna prior to gaining planning approval and that the proposal must be modified to ensure there are no significant impacts on any identified threatened species under the EPBC Act. It also provided the following figures on bird mortality per gigawatt hour for various forms of electricity generation:

> There are incidences of bird strike at wind farms, although some wind farms do not incur bird kills and modern wind turbines operate in low rotation speed modes thereby mitigating bird strike. This information, however, needs to be put in context and compared with other forms of electricity generation. A 2013 study estimated the number of birds killed per gigawatt hour (GWh) of generated wind electricity, fossil fuel and nuclear power systems. The study estimates that wind farms and nuclear power stations are responsible each for between 0.3 and 0.4 fatalities per GWh of electricity, while fossil fuelled power stations are responsible for about 5.2 fatalities per GWh.[203]

1.317 Labor Senators note that bird mortality rates at wind farms are established with greater accuracy than for other industries due to the greater levels of investigation undertaken by wind farm operators. As Ms Bennett, an independent consultant specialising in wind farm bird and bat mortality surveys, explained:

> Wind turbines are not unique in their impact on birds. Powerlines, roads, buildings, aeroplanes, cats, foxes, radio towers, pesticides, land use change, climate change and many other things are all negative pressures facing bird survival, and if we want to understand the impact our society has on birds then we need to understand each of these components and how they interact together to threaten species survival. Wind farm operators are doing their bit to understand their impact, but without a holistic approach by all industries the actual impact to the population is difficult to estimate.[204]

1.318 Concerns over the impact of wind farm developments on the brolga, which is listed as a threated species in Victoria but not in other Australian states nor under the

202 Environment Victoria, *Submission 304*, p. [2].

203 South Australian Government, *Submission 59*, p. 9.

204 Ms Emma Bennett, *Committee Hansard*, 9 June 2015, p. 33.

EPBC Act, were raised with the committee by the Brolga Recovery Group.[205] The group suggested that established and proposed wind farm developments across south west Victoria are having and will have a damaging impact on brolga populations. In particular the group argued that a recent bird utilisation study conducted at AGL's Macarthur wind farm demonstrated that 'Brolga are absent when turbines are operating at greater than 30% of capacity.'[206]

1.319 However, Labor Senators note Ms Bennett's statement that, in her 10 years of experience undertaking bird mortality surveys, 'the only time I found a dead brolga was in my capacity as a Landcare facilitator, where one of my volunteers phoned me up because they had found a dead brolga next to a wildlife reserve under powerlines.'[207] Mrs Susan Dennis, President of the Brolga Recovery Group, was not able to produce any concrete evidence of any recorded brolga deaths due to wind farms, but had also witnessed brolgas hitting power lines.[208]

1.320 Evidence provided by AGL on brolga monitoring at the Macarthur wind farm contradicts the Brolga Recovery Group's claims:

> Where required by planning permits, AGL undertakes monitoring programs to estimate the frequency of bird and bat deaths as a result of collision with wind turbines. In the first 12 months of monitoring at the Macarthur Wind Farm, an estimated mortality rate of 1.3 birds per turbine per year was observed, as well as 0.1 bats per turbine per year. Importantly, the effects on threatened species were found to be negligible, and no collisions with the primary avian species of concern at the site (brolga) were observed.[209]

1.321 Ms Bennett, who has conducted or supervised over 8,000 bird and bat mortality surveys at eight separate wind facilities, stated that such facilities have only a minor impact on the brolga:

> …population decline has been primarily due to loss of habitat, coupled with predation of chicks by foxes. Collision with powerlines is an unknown factor but a real threat to large birds. Wind farms will add another pressure to the declining brolga populations. However, by contrast this is relatively minor in view of those factors which have led to species decline.[210]

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205 See Department of Sustainability and Environment, *Advisory list of threatened vertebrate fauna in Victoria*, 2013, p. 11, http://www.depi.vic.gov.au/__data/assets/pdf_file/0019/210439/Advisory-List-of-Threatened-Vertebrate-Fauna_FINAL-2013.pdf, accessed 14 July 2015. The brolga is also listed as a species of 'least concern' in the IUCN Red List of Threatened Species, see *Antigone rubicunda* entry http://www.iucnredlist.org/details/summary/22692067/0, accessed 14 July 2015.

206 Brolga Recovery Group, *Submission* 107, p. [3], see also *Committee Hansard*, 9 June 2015, pp 38–43.

207 Ms Emma Bennett, *Committee Hansard*, 9 June 2015, p. 35.

208 Mrs Susan Dennis, *Committee Hansard*, 9 June 2015, p. 40.

209 AGL, Submission 83, p. 6.

210 Ms Emma Bennett, *Committee Hansard*, 9 June 2015, pp 33–34.

1.322 With regard to the Macarthur wind farm, Ms Bennett stated:

> Arguments about brolga displacement from wind farms are not supported by the evidence that has been collected. At Macarthur Wind Farm brolgas have been recorded breeding within 200 metres of a turbine and grazing within 100 metres of a turbine. At Mortons Lane Wind Farm a solitary brolga is a regular visitor to the paddock adjacent to the substation and within 200 metres of a turbine. There is also a natural flocking site that has remained undisturbed less than three kilometres away.[211]

1.323 Ms Bennett also commented on the ability of birds to learn to avoid wind farms, such that their impact reduces over time:

> There is lots of evidence all around the world about birds' behaviour and avoidance. That is shown through data where we may find an initial impact in the first month of operation which drops off significantly straight away and throughout the life of the wind farm. We have not done extensive long-term studies here in Australia, but there is certainly a lot of evidence, particularly with small wind farms such as the Hepburn wind farm, where we found no birds during our mortality monitoring at all. Small wind farms have clear avoidance patterns; that has been demonstrated. I would suggest that birds are not stupid.[212]

1.324 Labor Senators believe, based on evidence put before the committee, that wind farms in fact have a very limited impact on fauna, and on birds in particular, both in relative and absolute terms. While any negative impacts on wildlife are regrettable, evidence suggests that wind farm operators are better informed about, and more proactively responsive to, this side effect of their activities than are other industries.

1.325 On the particular issue of the interaction of brolgas and wind farms in south-west Victoria, Labor Senators do not believe any expert evidence was presented to the committee that recent wind farm development has had a significant impact on population levels.

1.326 With regard to aerial firefighting operations, the committee received no credible evidence that wind farms, when appropriately managed, pose greater risks than any other structures or have hampered the operations of rural firefighters. In fact the committee received evidence that wind farms have in some cases aided firefighting operations because they offer improved access for vehicles.

1.327 The New South Wales Rural Fire Service informed the committee that 'a fire moving across the area of a wind farm is generally managed in the same way as any other grass and/or bushfire.'[213] It further noted that, although 'aerial firefighting suppression in close proximity to wind turbines may be inhibited at times' this is because firefighting aircraft operate under the Civil Aviation Safety Authority's

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211 Ms Emma Bennett, *Committee Hansard*, 9 June 2015, p. 34.

212 Ms Emma Bennett, *Committee Hansard*, 9 June 2015, p. 35.

213 NSW Rural Fire Service, *Submission 97*, p. 1.

(CASA) *Visual Flight Rules* for navigating by visual reference and are required to maintain standard distances from wind turbines, as they are with 'any other potential hazard such as power lines, transmission towers, mountains and valleys.'[214]

1.328 A position statement developed by the Australasian Fire and Emergency Services Authorities Council emphasises that the risks posed by wind farms are routine and no greater than those posed by other activities:

> 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 fires 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.[215]

1.329 An example of the high level of fire safety precautions taken by wind turbine manufacturers and operators was provided by Pacific Hydro, who outlined the following measures present at their Cape Bridgewater wind farm:

- All major components within the wind turbine are fitted with temperature sensors. These sensors ensure turbines are closely monitored (24 hours a day) to ensure they remain within their designed operating range. If any of the settings are exceeded (e.g. because of fire, overheating, smoke), the turbine controller automatically shuts down the turbine and sends an alarm, via the control system, to a technician. Following a detailed inspection of the systems which caused the particular fault, the turbine will then be restarted as appropriate.
- Fire extinguishers are fitted in every turbine in the nacelle and at the entrance in order to comply with the relevant Australian Standards and regulations.

214 NSW Rural Fire Service, *Submission 97*, p. 1.

215 NSW Rural Fire Service, *Submission 97*, p. 8.

- Pacific Hydro's operating procedures, emergency evacuation/management procedures and up to date training of all personnel ensures that all operating and safety measures are adhered to.
- All vehicles entering the wind farm site must use diesel fuel and be fitted with fire extinguishers.
- Site personnel are equipped with the latest radio communication.[216]

1.330 The Victorian Country Fire Authority stated that it provides advice to owners and operators of wind farms and advice on planning permit applications. It has developed the *Emergency Management Guidelines for Wind Energy Facilities,* which provide guidance to operators on such matters as engagement with the CFA, siting of turbines, access recommendations and provision of firefighting water.[217]

1.331 When asked whether wind turbines are particularly problematic for firefighters, the Victorian Country Fire Authority stated:

> No. We have done an investigation of fire and incident reporting data over the last 17 years—so, back to 1998—and we have had 289 incidents in areas surrounding wind farms, none of them involving the wind farm facility as such. As you say, there are a lot of other risks within the natural environment rather than the towers themselves. From my perspective, from an operational perspective, we would rate trees themselves as being one of the highest risks to firefighters for injury and death over wind farms or wind towers.[218]

1.332 With regard to aerial operations in particular, the committee was informed:

> Basically, the air fleet that we use operates under visual flight rules. That means that they will not operate in low light or after light, or through cloud or smoke. Wayne has indicated that there are a lot of other, higher-risk areas, like power lines and the like, over wind towers. They are quite visible and they do not cause the aircraft any concern in aviation operations for CFA.[219]

1.333 The Australian Wind Alliance confirmed the advice of the Victorian Country Fire Authority that wind turbines are treated much like any other obstacle, and also noted that wind farms have a beneficial impact on firefighting efforts:

> Advice to AWA confirms the position of the Victorian CFA. Furthermore we have received advice that wind farms actually improve accessibility for

216 Pacific Hydro, Answers to questions taken on notice during 30 March public hearing, pp. [5–6].

217 Mr Andrew Andreou, *Committee Hansard*, 30 March 2015, p. 40; Victorian Country Fire Authority, *Submission 14 – Attachment 1*.

218 Mr Craig Brownlie, *Committee Hansard*, 30 March 2015, p. 41.

219 Mr Craig Brownlie, *Committee Hansard*, 30 March 2015, p. 41.

> fire intervention due to the proliferation of well maintained access roads and the presence of onsite staff who are alert to fire threats.[220]

1.334 Trustpower informed the committee that access tracks built for stage 2 of its Snowtown wind farm improved access for the local CFS and acted as a fire break during recent grassfires. They quoted the local Snowtown CFS captain's comments regarding the access roads:

> They were absolutely of great benefit in helping us fight the fires. If it weren't for those roads the fires, which were going at a fair rate of knots, would have just kept going. They acted as a natural fire break, giving us an edge to work back to and enabling us to back burn if we'd needed to. These new access roads provided an unexpected bonus, but they'll help us control fires in the future.[221]

1.335 The committee received advice from CASA that it had not identified any aviation accidents resulting from wind turbines:

> The data that CASA has readily available in the timeframe is derived from Aviation Safety Incident Reports from 2008 to the present. In that period CASA has not found any aviation accidents related wind farms or wind turbines. For the same period there 1,231, aviation accidents.[222]

1.336 The committee received several submissions raising concerns about the impact of the Gullen Range Wind Farm on the operations of the Crookwell aerodrome.[223] Labor Senators note correspondence from CASA in response to these submissions, which noted that it had been consulted on the original planning application for the wind farm and that NSW Planning had, consistent with the current National Airports Safeguarding Framework, deleted 11 proposed turbines that 'would have been within the boundary of the hypothetical obstacle limitation surfaces (OLS) for a local, daylight-only, non-instrument runway such as Crookwell.' There will now be 'no infringement of the theoretical OLS which have an extent of 3,600m from the aerodrome.'[224]

1.337 CASA has also examined safety issues in light of correspondence on the matter and concluded:

> That the wind turbines would not be hazardous obstacles for operations at Crookwell aerodrome provided pilots are above the required minimum altitudes for day and night operations. The wind turbines present a pilot with conditions that their training equips them to deal with. In this context

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220 Australian Wind Alliance, Answers to written questions on notice, 7 July 2015, p. 10.

221 Trustpower, Answers to questions taken on notice at 16 June public hearing, p. 3; Infigen Energy also commented on improved access for firefighters at the Snowtown windfarm and provided photos of the firefighting operations in its submission, see *Submission 425*, pp. 14–16.

222 Civil Aviation Safety Authority, Answers to written questions on notice, 11 June 2015, p. [1].

223 Parksbourne/Mummel Landscape Guardians Inc, *Submission 119*, p. 91; Mr Jim Hutson, *Submission 30*.

224 Civil Aviation Safety Authority, *Response to Submission 119*, p. 2.

> CASA agrees with the view expressed by the NSW Rural Fire Service (Submission 97) that wind turbines are not expected to pose increased risks due to wind turbulence or rotating blades. The NSW Rural Fire Service notes pilots are required to maintain standard distances from wind turbines, just as they are from other potential hazards such as power lines, transmission towers, mountains and valleys.[225]

1.338 With respect to the issue of turbulence, CASA's response also noted that the '3,600m exclusion zone mandated by the NSW Government should ensure that excessive turbulence from the rotors is not experienced in the immediate vicinity of the aerodrome' and that the aerodrome is already subject to warnings regarding natural wind effects due to the Gullen Range itself.[226]

1.339 Finally, Labor Senators note the concern raised by the Aerial Agricultural Association of Australia (AAAA) regarding the safety threat posed by wind farm developments to low-level aviation.[227] In general, as noted by the Clean Energy Council, Labor Senators agree with the Clean Energy Council that, 'Wind turbines are just another obstacle to be managed in planning and conducting low level aerial operations. It is the responsibility of the pilot to anticipate, assess and make operational judgments as to how close they fly to an obstacle.'[228]

1.340 As noted by Vestas, the US state of Iowa provides an example of the very productive coexistence of the cropping and wind power industries:

> From the 2007 Census to the 2012 Census, Iowa's total value of agriculture production increased 51 percent. The value of crops sold also increased by 69 percent, and the value of Iowa livestock production increased by 34 percent.
>
> Iowa is also the third-biggest producer of wind power in the USA. The wind industry has grown in Iowa to create between 6000 and 7000 direct and indirect jobs, with an installed capacity of almost 6000 MW of wind power (significantly more than all of Australia's installed wind capacity). The wind industry in Iowa has attracted around US $10 billion of capital investment.
>
> In Iowa the wind industry and the cropping industry have learnt to co-exist and do so in a safe and profitable manner. Accordingly we see no reason why Australia is any different.[229]

1.341 In the specific case of wind monitoring towers, which are often associated with wind farm developments and can be very difficult for pilots to see, Labor Senators agree that high visibility marking is essential. This matter is covered at section 39 of the National Airports Safeguarding Framework Guideline D, and Labor

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225 Civil Aviation Safety Authority, *Response to Submission 119*, p. 1.

226 Civil Aviation Safety Authority, *Response to Submission 119*, p. 1.

227 Aerial Agricultural Association of Australia, *Submission 20*, p. 1.

228 Clean Energy Council, *Submission 450*, pp 10-11.

229 Vestas, Answers to questions taken on notice at 9 June public hearing, p. [4].

Senators urge wind farm operators to ensure they implement the measures suggested there.[230]

230 National Airports Safeguarding Framework Guideline D, p. 6, https://infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/files/4.1.3_Guideline_D_Wind_Turbines.pdf, accessed 15 July 2015.

(h) the energy and emission input and output equations from whole-of-life operation of wind turbines

1.342 Evidence presented to the committee unequivocally demonstrates that wind turbines rapidly generate more energy than is used in their whole-of-life operation, including construction, installation, operation and decommissioning, and that wind turbines produce among the lowest emissions per unit of electrical energy of all generation types.

1.343 With regard to the greenhouse gas emissions intensity of wind farms, the Energy Supply Association of Australia referred to a recent analysis conducted by the US National Renewable Energy Laboratory, which concluded that the greenhouse emissions generated by wind farms are dwarfed by those of coal or gas fired power plants:

> …the median published life cycle greenhouse gas emission estimates for onshore wind farms is 12 grams of carbon dioxide equivalent CO_2-e for each kWh of electricity generated (gCO_2-e/kWh). In contrast, coal-fired power plants emit 979 gCO_2-e/kWh on average. This varies significantly depending on the type of coal used and the type of generation technology. Gas-fired power plants emit between 450 (combined cycle) and 670 gCO_2-e/kWh (open cycle).[231]

1.344 The IPCC has also published figures on this matter in its 2014 *Mitigation of Climate Change* report. Its findings on this topic were summarised by RATCH-Australia Corporation as follows:

> - Median lifecycle emissions from a coal-fired power station are 820 grams of carbon dioxide-equivalent emissions per kilowatt hour of electricity generated (820 gCO_2eq/kWh).
> - Median lifecycle emissions from a combined cycle gas power station are 490 gCO_2eq/kWh.
> - Median lifecycle emissions from an onshore wind farm are 11 gCO_2eq/kWh.[232]

1.345 Siemens has recently published calculations that indicate one of its turbine models has an energy payback period of 4.5 months.[233] Vestas informed the committee that each of its turbines generates over 25 times the energy consumed during its lifecycle.[234] Further, in documentation published by the New South Wales Department of Environment, Climate Change and Water, it has been estimated that

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231 Energy Supply Association of Australia, *Submission 299*, p. 3.

232 RATCH-Australia Corporation, Answers to Questions taken on notice during 18 May public hearing, p. 5.

233 Siemens, Press Release, 'Siemens publishes Environment Product Declarations for wind turbines', 26 November 2014, http://www.siemens.com/press/pool/de/pressemitteilungen/2014/windpower-renewables/PR2014110070WPEN.pdf, accessed 10 July 2015.

234 Vestas Australian Wind Technology, *Submission 298*, p. [6]

wind farms 'typically generate the energy used in construction within three to seven months of operation, with the operational lifetime of a turbine being at least 20 years.'[235]

1.346 Based on these figures, it is clear that wind farms emit a small fraction of the greenhouse gasses generated by coal and gas power stations. It is also clear that they very quickly recover the energy used in their production and installation.

1.347 The level of greenhouse gas abatement achieved depends on which type of generation wind power is displacing. This matter was explained by AGL:

> Under the design of the National Electricity Market (NEM), generators bid their capacity into the market, and the market operator (AEMO) is responsible for dispatching the lowest-cost capacity to meet demand for each half hour interval of the day. Wind farms tend to have low operating costs, so generally can bid in their generation capacity at a low price, and are therefore dispatched ahead of generators with higher operating costs (such as gas or coal).
>
> The amount of greenhouse gas emissions avoided via the operation of wind farms at any given time depends on the emissions intensity of the 'marginal' generator(s) that would otherwise have been dispatched to meet electricity demand, which may produce more or less emissions per unit of electricity generated than the market average depending on the fuel and age of the power station.[236]

1.348 The Department of the Environment summarised the findings of recent modelling undertaken for the Warburton Review of the RET scheme by ACIL Allen to calculate emissions abatement. Although this modelling is based on a target which has since been reduced, it remains instructive:

> The modelling estimates that 50 to 60 per cent of the additional renewable electricity generated displaces black goal generation, while brown coal and baseload gas make up around 20 per cent each of the electricity generation displaced. Hydro and peaking gas generation is also slightly reduced in many years.
>
> …
>
> The modelling indicates this decrease in electricity generation from black coal, brown coal and gas would reduce emissions by 59 Mt CO_2-e between 2015 and 2020, and 299 Mt CO_2-e between 2015 and 2030.[237]

1.349 With regard to the level of abatement achieved to date under the RET, the Warburton Review itself noted:

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235 Department of Environment, Climate Change and Water, *Wind Energy in NSW: Facts and Myths*, p. 27, http://masg.org.au/wp-content/uploads/2008/06/Wind-Energy-In-NSW-Myths-and-Facts.pdf , accessed 10 July 2015.

236 AGL, Answers to questions taken on notice during 19 May public hearing, p. 2.

237 Department of the Environment, *Submission 358*, pp 12–13.

> Historical CO_2-e emissions abatement from the RET has been estimated by SKM to be around 20 Mt CO_2-e between 2001 and 2012. The modest level of abatement achieved to date primarily reflects the small targets in effect under the scheme from 2001 to 2009.[238]

1.350 The Warburton Review also referred to a body of modelling work on the significant increase in greenhouse emissions that would occur were the RET to be repealed:

> Bloomberg New Energy Finance estimates that removing the RET would increase cumulative emissions from the power sector by 57.3 Mt CO_2-e over the period 2015 to 2020 and 259 Mt CO_2-e over the period 2015 to 2030. Modelling by ROAM Consulting for the Clean Energy Council found that cumulative emissions would be 34.7 Mt CO_2-e higher by 2019-20 if the RET is repealed and modelling by Schneider Electric suggests that removing the LRET would increase cumulative emissions in the National Electricity Market by around 50 Mt CO_2-e by 2020 and by 260 Mt CO_2-e by 2030.[239]

1.351 Labor Senators note that the overall emissions intensity of electricity generation in the NEM has fallen in recent years. This has occurred at the same time as the generation mix has altered, with significant reductions in energy produced by coal and increases in energy produced by wind and other renewables and by gas. Thus, the overall impact of changes in the energy generation mix in favour of renewables and gas has been to reduce the emissions intensity of electricity generation in Australia, even as absolute emission levels continue to increase.[240]

1.352 The South Australian Government provided information on the reduction in emissions brought about by the significant growth in the share of wind power in its generation mix:

> In terms of overall output, wind overtook coal based generation to become the second most relied upon generation source in the State's electricity mix in 2011-12. Data from the National Greenhouse Accounts shows that emission factors for electricity production in the state has reduced as a result of wind energy. In 2010 Scope 2 emissions from purchased electricity produced 0.72 kilograms of carbon dioxide equivalent per kilowatt hour and in 2012 it had reduced to 0.61.[241]

1.353 Labor Senators note that claims made by some witnesses that the interaction between wind farms and other forms of generation in the NEM lead either to no

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238 Dick Warburton, Brian Fisher, Shirley In't Veld, Matt Zema, *Renewable Energy Target Scheme: report of the Expert Panel*, 15 August 2014, p. 11.

239 Dick Warburton, Brian Fisher, Shirley In't Veld, Matt Zema, *Renewable Energy Target Scheme: report of the Expert Panel*, 15 August 2014, p. 41.

240 Pitt & Sherry, 'Carbon emission index – electricity emissions update – data to 30 June 2015', http://www.pittsh.com.au/assets/files/Cedex/CEDEX%20Electricity%20Update%20July%202015.pdf , accessed 14 July 2015.

241 South Australian Government, *Submission 59*, p. 10.

greenhouse gas abatement or to a massive increase in the utilisation of coal-fired generation, were comprehensively refuted by material provided to the committee.

1.354 For example, Mr Hamish Cumming claimed that the addition of wind farms to the electricity grid had resulted in an additional six million tonnes of coal being burnt at AGL's Loy Yang A plant per year and that wind farms are forcing the production of more greenhouse gas emissions than would be the case if they did not exist.[242]

1.355 AGL's response to these assertions was as follows:

> As demonstrated in AGL's supplementary submission, wind generation does not materially increase coal consumed at our thermal power stations. For example…for AGL's Loy Yang A Power Station in Victoria both the amount of coal combusted and the amount of coal used to generate each unit of electricity sold has remained reasonably consistent over the past six years - despite the significant growth of wind power in the National Electricity Market. This data is consistent with reporting to the Commonwealth Government under the National Greenhouse and Energy Reporting Act 2007.[243]

1.356 Some witnesses argued that the contribution of wind power to the reduction of greenhouse gas emissions is less than 100 per cent 'efficient' in that the percentage reduction in greenhouse gas emissions across the whole NEM is lower than the percentage of electricity generated by wind farms. This purported effect was attributed to two consequences of the integration of wind farms into the NEM: first, that wind farms often replace the relatively less emissions intensive gas generators; second, that when wind farms are operating coal generators operate under part load, which is less efficient.[244]

1.357 The nature of wind farm power generation may lead to some marginal loss of efficiency of other generators in the NEM. Nevertheless, even on the calculations provided by those who emphasise this effect, in absolute terms wind power still leads to significant greenhouse gas abatement calculated across the whole network.

1.358 As noted above, Dr Joseph Wheatley and others maintained that wind power imposes inefficiencies on other parts of the network such that it does not reduce emissions at the same rate as it replaces other sources of energy generation:

> We looked at the calendar year 2014, and our main findings were that in 2014 wind power generation provided 4.5 per cent of all energy generated on the NEM but it reduced emissions by a lesser amount—by 3.5 per cent.

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242 Mr Hamish Cumming, *Submission 31*, p. [3]; see also evidence at *Committee Hansard*, 30 March 2015, pp 45–62.

243 AGL, Answers to questions taken on notice during 19 May public hearing, p. 4.

244 Dr Joseph Wheatley, *Committee Hansard*, 19 May 2015, pp 77–79; see also Dr Joseph Wheatley, *Submission 348*.

> So the effectiveness is the ratio of 3.5 to 4.5, which is about 80 per cent effective, and we would argue that is a significant loss of effectiveness.[245]

1.359 However, regarding the question of how much coal or gas power is actually displaced by wind power, taking into account any increased standby requirements on non-renewable generators, the committee received the following evidence from the Australian Wind Alliance:

> The Inquiry has heard evidence that what is required to properly answer this question is to analyse actual emissions data at short time intervals from coal-fired power stations. Just such a study was conducted in 2013 by America's National Renewable Energy Laboratory (NREL) using hourly emissions data from nearly every power plant in the Western U.S. It was reviewed by 55 experts including representatives from eight utilities.
>
> This study found that the emissions cost of cycling was 'negligible' and that a 'high wind scenario' of 25% wind and 8% solar produced a 29% - 34% decrease in CO2 emissions. That is, 1 kWh of wind (or solar) generation displaces almost all the emissions from the coal- and gas- fired power stations that remain in the grid, even when cycling is taken into account.[246]

1.360 The Australian Wind Alliance also highlighted analysis on the situation in South Australia which suggests that 'wind energy, even at high penetration levels, does indeed displace the full emissions of the coal and/or gas fired power it replaces.'[247] Regarding the high level of wind power in the South Australian generation mix, Windlab Systems came to the following conclusions:

> Wind power generation has increased substantially in South Australia in the last eight years, from supplying 6% of the state's needs in 2005/06 to 25% in 2012/13.
>
> This increase in wind generation has been the primary reason for a 34% reduction in CO2-e emissions due to electricity generation. The electricity network has managed to accommodate this increase in wind power without increasing the amount of electricity required from peaking power plants.
>
> Energy produced from these peaking plants has actually reduced during this same period, which has helped further reduce CO2-e emissions. Wholesale prices have not risen over the period (even with LGC costs included) and we conclude the cost of abatement using wind is low.[248]

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245 Dr Joseph Wheatley, *Committee Hansard*, 19 May 2015, p. 77; Dr Joseph Wheatley, *Submission 348*; see also Mr Peter Lang, *Committee Hansard*, 19 May 2015, pp. 59–62; Mr Peter Lang, *Submission 259*.

246 Australian Wind Alliance, Answers to questions on notice arising from 19 May public hearing, pp [1–2].

247 Australian Wind Alliance, Answers to questions on notice arising from 19 May public hearing, p. [2].

248 Dr David Osmond and Luke Osborne, *Peaking Capacity, CO2-e Emissions and Pricing in the South Australian Electricity Grid with High Wind Penetration 2005-2013*, p. 4, http://www.windlab.com/sites/default/files/20110915_SouthAustralianWindPower_DO_LHO.pdf, accessed 21 July 2015.

1.361 On the basis of this evidence, it appears that the introduction of renewable energy abates very nearly all of the emissions generated by the fossil-fuel generation it replaces.

1.362 The related issue of 'spinning reserve' was also raised by some submitters and witnesses, who argued that, due to its intermittent nature, the incorporation of renewable energy generation into the electricity grid increases the requirement to have other generators on standby but not providing electricity and thereby reduces the efficiency the grid. This issue overlaps somewhat with the discussion above of the abatement efficiency of wind generation.

1.363 The CER provided the following explanation of the purpose of spinning reserve in the operation of the electricity grid:

> Spinning reserve is the generation capacity that is on-line but not providing electrical energy that can respond to compensate for sudden generation or transmission outages. Spinning reserves are the first type used when dispatch shortfalls occur, which helps keep the grid operating in a stable manner. Because the level of electricity demand varies with time, enough spinning reserve in the system is required to maintain system stability.[249]

1.364 The AEMO is responsible for managing the stability of the NEM. It provided evidence that directly refuted claims that the introduction of greater levels of wind has required an increase in capacity dedicated to maintaining the stability of the grid.

1.365 The AEMO noted that it does not employ the term 'spinning reserve', which originates in North America, and that the NEM, due to its design, does not have a directly comparable feature. The AEMO does, however, operate a Frequency Control Ancillary Services (FCAS) market, which it explained as follows:

> AEMO operates “Frequency Control Ancillary Services” (FCAS) markets which match supply and demand over timescales shorter than the NEM’s energy dispatch cycle of five minutes. Beyond that timescale variations are balanced by energy dispatch. In some overseas markets the dispatch cycle is longer, e.g. 60 minutes, requiring balancing services beyond the scope of FCAS. Some energy markets operate on a day ahead basis rather than in real time.[250]

1.366 The AEMO further explained that it has not changed the amount of FCAS in response to the rising level of wind generation in the grid and that FCAS costs represent only about one per cent of market turnover:

> AEMO recruits sufficient FCAS in order to meet the frequency standards and keep the power system secure at all times. To date AEMO has not measurably changed the amount of FCAS it recruits as a result of the growth in wind generation. It is possible that more of one form of FCAS – regulation – may be required in time due to the sub five-minute variability of wind generation. It should be noted that total NEM FCAS costs are

249 Clean Energy Regulator, *Response to Submission 31*, p. 2.

250 Australian Energy Market Operator, *Submission 469*, p. 11.

> relatively small, comprising about one percent of energy market turnover.[251]

1.367 The AEMO emphasised that, although renewable generation does present some technical challenges, the NEM is uniquely well placed to deal with them due to its design. It again emphasised that it has not increased ancillary services in response to increasing levels of renewable generation:

> The NEM has been uniquely successful in securely integrating wind generation to date at low cost. For example, AEMO has not had to change or materially increase the quantity of ancillary services purchased to maintain system security.[252]

1.368 It is important to note that spinning reserves are maintained in order to meet 'sudden generation or transmission outages'. The committee received evidence that, although wind generation is certainly intermittent in that it generates electricity only when the wind is blowing, it is also generally highly predictable. Pacific Hydro referred the committee to the Australian Wind Energy Forecasting System operated by the AEMO, which enables the efficient operation the electricity dispatch system by accurately forecasting wind conditions across the country.[253]

1.369 It is also important to note that spinning reserves are a feature of the operation of the electricity grid regardless of the presence of wind generation and that the size of the spinning reserves, or contingency, are generally determined by the largest power station in the grid so that its sudden loss would not unbalance the system. This matter was explained by RATCH-Australia Corporation:

> In terms of the size of the reserve that needs to be sitting there waiting as backup, our national electricity market, called the NEM, considers that a credible contingency event is the unexpected loss suddenly of one power station on the network. So the spinning reserve backup needs to be large enough to cover the loss of electricity generation in case any one of the currently operated power stations suddenly shuts down.
>
> I am simplifying a little here because the details get very technical, but the critical case here is if the largest of the currently operating power stations suddenly shuts down, so the spinning reserve is sized to cover this one, the largest one. If it is going to cover the loss of the largest power station then it would cover the loss of any of the others if they were to fail as well. Up to this date in the NEM, the largest power station has been a coal fired power station. Wind farms can be quite big, they can comprise many turbines, but overall the size of a wind farm is generally a fair bit smaller than the size of

251 Australian Energy Market Operator, *Submission 469*, p. 11.

252 Australian Energy Market Operator, *Submission 469*, p. 4.

253 Mr Andrew Richards, *Committee Hansard*, 30 March 2015, pp 14–15. For a detailed explanation of the Australian Wind Energy Forecasting System, see AEMO, 'AWEFS', http://www.aemo.com.au/Electricity/Market-Operations/Dispatch/AWEFS, accessed 20 July 2015.

> one coal fired power station. So the spinning reserve is sized to cover the loss of one coal fired power station.
>
> So there is no extra requirement for spinning reserve due to wind turbines. If a wind turbine was to fail, if a whole wind farm were to fail, if the wind suddenly stopped blowing, which is something that does not actually happen—the wind is very predictable and forecastable, and it does not just stop blowing—but let's say for some reason a wind farm suddenly shuts down, whatever backup is there would be there, whether or not that wind farm was operating, because there is always a larger power station which it needs to be there for as well.[254]

1.370 Using the example of South Australia, Pacific Hydro also explained that, despite the very high level of wind power in that state, there had been a decrease in the capacity of coal-fired power stations:

> South Australia has significantly more wind energy than any other Australian state, which makes it a good case study when it comes to integrating wind energy into the grid. According to the Australian Energy Market Operator, wind generation in South Australia was sufficient to meet the state's entire operational consumption for the first time on 27 June 2014 between 4.10 am and 4.35 am. AEMO have also found that for 90% of the time, South Australian wind generation varies by less than 2% across five-minute periods, and by around 3% across 10-minute periods. In addition to this, AEMO reports that the capacity factor of coal stations is dropping in the state, clearly demonstrating that wind farms are displacing coal fired power generation in the state.[255]

1.371 Labor Senators therefore conclude that the issue of maintaining sufficient 'spinning reserve' is one that affects the electricity network as a whole, rather than renewable generation in particular. No type of power generation is completely reliable and capacity must be maintained to cover unexpected events; this is a consequence of maintaining a reliable grid and cannot be attributed only to the presence of renewable energy generation.

1.372 Labor Senators highlight the summary of this matter provided by the CER:

> As spinning reserve is required to maintain system stability, one MWh of renewable generation may indeed not displace the exact amount of fossil-fuel generation required for the same one MWh of electricity. On the other hand, it should not be assumed that fossil-fuel generators continue to burn fuel and hence generate emissions at the same rate regardless of the amount of renewable generation (mostly wind) that is dispatched. Overall, it is more likely that the extra emissions from increased spinning reserve are a small proportion of the emissions reductions from displacement of fossil-fuel generation.[256]

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254 Mr Joseph Hallenstein, *Committee Hansard*, 18 March 2015, pp 7–9.

255 Pacific Hydro, Answers to questions taken on notice during 30 March public hearing, p. [4].

256 Clean Energy Regulator, *Response to Submission 31*, p. 3.

1.373 Labor Senators also emphasise that assertions made by some witnesses that renewable energy certificates are being incorrectly claimed because the actual greenhouse gas emissions achieved by the introduction of renewable generation varies depending on which form of generation is displaced at a given point in time are also baseless. Such a claim was put to the committee by representatives of the Association for Research of Renewable Energy Australia. Further criticisms of the conduct of the CER founded on this claim are also baseless.[257]

1.374 First, as noted by the CER, clean energy certificates are not granted on the basis of greenhouse gas abatement, but on the basis of electricity generated. The CER emphasised this point and explained:

> The eligibility formula makes no reference to the amount or emissions intensity of fossil-fuel generated electricity that is displaced by the renewable generated electricity. Therefore, the Regulator is neither required, nor has the power, to vary the number of LGCs issued according to emissions reductions achieved.
>
> As a matter of practicality this would be exceedingly difficult to determine on a case by case basis because of the pooled nature of the electricity market. Generators offer to supply the electricity market with specific amounts of electricity at particular prices. Dispatch prices are determined every five minutes (aggregated to a 30 minute trading interval) and it would be difficult to establish what would have been dispatched in the absence of the renewable electricity and hence what emissions were avoided at the time.[258]

1.375 Second, as presented in the discussion above of Dr Joseph Wheatley's claims, strong evidence was provided to the committee that in fact renewable generation does displace very nearly all of the emissions from fossil fuel generators.

1.376 The claims presented to the committee regarding the invalidity of renewable energy certificates is mistaken about both the legal foundation on which the certificates are issued and the factual question concerning the level of abatement achieved by renewable generation.

1.377 Based on the evidence presented to the committee on element (h) of the terms of reference, Labor Senators believe that there is a great deal of information available on the greenhouse gas emissions intensity of wind power and on its overall effect on the emissions intensity of the NEM. On both measures wind power is clearly having a positive impact and its further development should be encouraged.

257 Association for Research of Renewable Energy in Australia, *Submission 372*, pp 10–11; see also evidence at *Committee Hansard*, 29 June 2015, pp 54–58.

258 Clean Energy Regulator, *Response to Submission 31*, pp 1–2.

Senator Anne Urquhart **Senator Gavin Marshall**