

Caithness West Action Group (CWAG)

Precognition

by

David Craig

DPEA Ref IEC/3/105/3
Highland Council Reference. No. 04/00342/S36CA

Before: Mr David Russell, MA (Hons), MPhil, MRTPI, Principal Inquiry Reporter,
DPEA

1. My name is David Robert Craig. I live at Sandford House, Achvarasdall, Caithness, approximately 2.5km from the proposed development, and on the proposed transport route for component parts. I am a Principal Consultant for a private company and have lived in Caithness for over 24 years. I am married with two girls aged sixteen and twelve, who were born in Caithness, as was my wife.
2. I have the following relevant professional qualifications and experience: First Degree in Chemistry, Masters Degree in Chemical Engineering design, Chartered Chemist, Member of the Royal Society of Chemistry. I have over 28 years experience in the nuclear industry, including 18 years experience in waste management, safety and environmental consultancy.
3. I would consider myself a supporter of green initiatives and renewable energy and am in favour of renewable energy developments as part of a balanced energy portfolio, provided they are constructed in suitable locations and at suitable distances from immediate residences in order to avoid detriment to those in the surrounding area.
4. I am appearing at this Inquiry for the following reasons,
5. (1) I have been asked to represent the views of local residents of the immediate area around the proposed development;
6. (2) I am concerned at how close this proposed development is to residents, and how little concern has been shown by the developers toward those residents;
7. (3) I strongly believe that this development would be severely detrimental to those residents' quality of life;
8. (4) I strongly believe that this development poses a health and safety hazard to residents of the area, workers in the area, and drivers on the nearby roads;
9. (5) I believe that transport of components for this development has not been considered properly by the developers, and fails to assess safety aspects of the proposed transport strategy;
10. (6) I believe that health and safety issues from this development have not been considered properly by the developers, and that data supplied in this

- regard by the developers fails to meet best practice or accepted guidelines;
11. (7) I believe that the claimed CO₂ savings from this development are extremely exaggerated and have been used to misrepresent "facts" to the public, and
 12. (8) I believe that consultation with local people has been paid "lip service" by the developers and that views of local people have been largely ignored by the developers. I will present evidence about distance to residential homes, safety, health issues, recommended setback distances, transport, and will show how the developer has misled the public regarding claimed CO₂ savings from this turbine site.
 13. Most of my evidence is concerned with health and safety, and is organised as follows:
 - A short history of the proposed Baillie wind power station;
 - Shortcomings in the Baillie Environmental Statement;
 - Distance to residential properties;
 - Safety Issues;
 - Potentially adverse health effects;
 - Human rights;
 - Recommended setback distances;
 - Transport;
 - Misleading the public in claimed CO₂ savings.
 14. The Reporter is asked to please note that I will not be presenting this evidence as an expert witness but as a local resident presenting my own and the views of the community around the proposed development site.
 15. **A short history of the proposed Baillie wind power station - A history of not listening**
 16. In 1994 a planning application was submitted for a 10 turbine wind power station on the Baillie site [ES reference CWAG/092]. This application was

not fully progressed and was subsequently withdrawn. However the scheme prompted significant local unrest with a number of articles in the local press highlighting this. Despite this, the developers pushed ahead with a significantly bigger scheme.

17. In June 2003, a scoping report [CWAG/093] was submitted to Scottish Ministers for a 24 turbine, nominal 63MW wind power station. Scottish Ministers responded to this report in August 2003 [CWAG/094]. Their response included the following scoping requirements:
 - *"Public safety: 1.3 The Environmental Statement should address safety factors such as blade throw and ice deposition"*
 - *"Traffic and roads: 2.18 The Environmental Statement should consider... Types of vehicles and dimensions which would be used during construction"*
 - *Visual Impact - nearby properties: 2.22 An appropriate separation distance on visual grounds from nearest residences needs to be assessed in the Environmental Statement. It should be noted at this stage that such distances are much closer than for other current proposals, and with larger proposed machines. A "rule of thumb"..... is that large wind turbines not associated to properties should be located no closer than 10 X total turbine height to properties."*
18. Despite this advice from Ministers over five years ago, none of these points have been addressed by the developers. Thus the developer has failed to accept Minister's advice.
19. In 2004, the developer illegally erected a 60m anemometer on the site. Alastair MacDonald will address this matter in more detail. Retrospective planning permission was sought and was granted, subject to appropriate planning conditions. The developer's failure to meet one of those planning conditions led to Highland Council serving a formal Breach of Condition Notice on the developer. This followed three letters from Highland Council and two site visits, which the developer had subsequently ignored. Thus the developer has failed to accept Highland Council's requirements and expressions of concern.

20. In July 2004 a consultation was started by Scottish Ministers for a revised power station at Baillie comprising of 25 turbines with overall output between 67.5MW and 75MW [ES reference CD2A]. Response to that consultation exercise will be described by Alastair MacDonald.
21. Responses to that consultation included my own letter of objection to ECU dated 17 August 2004. Points made include those with regard to claimed "CO₂ savings", the use of data from an illegally-installed anemometer, lack of public consultation, noise, distances to occupied housing, visual impact, effect on tourism, and health and safety issues.
22. Since then the only issue which I raised and which has attempted to be addressed by the developer in any serious way is that of "public consultation". That will be addressed separately by Alastair MacDonald.
23. In January 2006, a further consultation was undertaken by Scottish Ministers following publication of an addendum to the 2004 Environmental Statement [CD2B]. This addendum featured a revised turbine layout and a reduction in turbine numbers from 25 to 21. The revised layout was proposed following consultation responses on the 2004 Environmental Statement, and included the following key issues raised by Highland Council, SNH, RSPB, SEPA and Scottish Ministers:
 - *SNH and RSPB requested that further baseline surveys and assessments were carried out with respect to potential impacts on bird species;*
 - *Potential cumulative effects due to a number of other wind farm proposals - both built, consented and subject to scoping;*
 - *The proximity of turbines to the road;*
 - *Effects of shadow flicker from turbines close to housing; and*
 - *Noise effects on nearby housing.*
24. Of the above, none, in my opinion, have been adequately addressed.
25. Comments by Scottish Ministers regarding public safety and the "rule of thumb" regarding distances between turbines and housing have been completely ignored.
26. SPP6 [CD18] states *"Representations received from the public, based on relevant planning matters, will be one of a number of material*

considerations that should be taken into account". However, consultation responses submitted by members of the public have been completely ignored. This is confirmed in the 2006 ES addendum - *not one* single response from or concern raised by the public is listed.

27. In 2007 a further addendum was submitted on "Peat Slide".
28. Nothing appears to have been taken into account by the developers in response to Consultation Responses submitted by members of the public to the consultation on the 2006 ES addendum and 2007 ES addendum.
29. The developers have therefore failed to comply with SPP6 and have failed to accept valid material considerations submitted by the public.
30. In January 2008, Highland Council considered the proposal at the area planning committee meeting, and unanimously (11 to zero) voted against the proposal. The resulting letter to ECU and accompanying report [CWAG/042], noted that the reasons for rejection included:
 - Proximity to dwellings;
 - Cumulative impact;
 - Adverse impact on tourism;
 - Adverse visual impact.
31. I would ask the Reporter to note that each of the above reasons for objection have been raised in the past, yet the developers have not engaged with the Council, the Public or other local Stakeholders to satisfactorily resolve the issues. The developers also failed to engage with Highland Council regarding the anemometer illegally erected in 2004, and only complied with planning conditions after a formal Breach of Condition notice had been served on them. I believe that this failure to listen and failure to follow basic planning rules and requirements shows little respect or regard toward relevant authorities or the Public.
32. In summary I would suggest that the above history and developer's track record in failing to follow basic planning rules and requirements, and in failing to satisfactorily engage with local Stakeholders (including the Public), demonstrates that the developers are unsuitable to undertake construction and operation of a large industrial wind power facility, and that alone should result in refusal of this proposal by Scottish Ministers.

33. Shortcomings in the Baillie Environmental Statement

34. Shortfalls, errors and misleading comments can be found throughout the developer's Environmental Statement and subsequent supporting documents. Many of these have been outlined to Highland Council and ECU through letters of objection and correspondence by members of the public. A series of correspondence should be available in the public records for this Inquiry, and these will not be discussed further here. Additional mistakes and shortfalls may be picked up by other witnesses.

35. The main points I would like to concentrate on are:

- Developers failure to follow BWEA's Health and Safety Guidelines and advice regarding the Environmental Statement;
- Developers lack of any consideration regarding operational safety performance with respect to members of the public;
- Developers lack of complete cumulative impact assessment for the area as requested by Statutory Consultees;
- Developers failure to provide all relevant data for abnormal loads to be transported;
- Errors in transport assessment undertaken.

36. Failure to follow Health and Safety Guidelines and Advice regarding Environmental Statements

37. BWEA Guidelines for Health and Safety in the Wind Industry [CWAG/021] clearly lay out an approach to site development and planning. Section 7.3 of that document deals with public safety considerations, and states the following:

"Specific issues on which public safety assurance is appropriate include:

- *Turbine/structural integrity;*
- *Fire/flame spread;*
- *Ground stability;*
- *Lightning;*
- *Falling objects;*

- *Ice throw;*
- *Public access;*
- *Site security and signage (for vehicles).*

For wind farm schemes in the process of development, it is recommended that the Environmental Assessment accompanying the planning application includes a section on public safety considerations, stating how it is intended to address the above aspects."

38. The 2004 ES [CD2A] and 2006 ES addendum [CD2B] effectively ignore the majority of the above aspects as would be followed had best practice been applied.
39. In the **2004 ES** [CD2A], Health and Safety are demoted to a sub-section under Section 13 "Miscellaneous Issues".
40. 2004 ES Section 13.3.2 addresses design and construction. This section details site security arrangements during the construction phase, and does address site access and signage. It also states that "*A distance of 110m (turbine height to tip) has been allowed between the road to the south of the site (Sustrans Route 1) and the nearest turbine.*" The section also notes a distance of 120m between the nearest turbine and the 132kV electrical line crossing the site. This goes some way to addressing structural integrity, though does by no means fully address this risk. It is interesting to note that the 132kV line is offered additional leeway when compared to members of the public using the Sustrans Route 1 (C1 road).
41. 2004 ES Section 13.3.3 addresses operation of the turbines. It states that "*an operational management plan will be produced to protect operational staff and visitors to site.*" It is noted that this fails to address operational risks to members of the public outside the site - for example, local residents and road users. A statement is also made in Section 13.3.3 regarding ice throw "*operational procedures will include actions to ensure worker safety in relation to ice throw.*" As above, this fails to address risks to members of the public outside the site - for example, local residents and road users.

42. 2004 ES Section 13.4 addresses Shadow Flicker, and acknowledges that assessment of Shadow Flicker is appropriate within 10 rotor diameters of properties (10 rotor diameters equals 800m).
43. CWAG/025 Table 1 shows 15 properties within 800m of the proposed turbine locations. However, only properties at Barnaheigh, Hillcrest, Achiebraskill and Skiall #6 are mentioned as being at risk. All have financial involvement with the wind turbine development, or are owned by the developer. Properties without financial interest, including 3 Stempster Holdings, 4 Stempster Holdings, Stempster Barn, Stempster House, 8 Skiall, 5 Skiall, The Old School House (Shebster) and The Old Manse (Shebster), are not considered. This is a clear failure by the developer.
44. The section on Shadow Flicker makes no mention of consultation with the public or local health providers regarding those suffering from epilepsy. Epilepsy can be triggered by Shadow Flicker. At least one member of the public has confirmed in their objection letter that a resident suffers from epilepsy. The location is north of the turbines at a distance of 1050m. This has been ignored by the developers. By failing to engage with local health providers and the public this issue remains unresolved.
45. With regard to the specific public safety issues recommended to be addressed in the BWEA guidelines [CWAG/021], the following apply with respect to the data presented in the 2004 ES [CD2A]:
 - *Turbine/structural integrity - partly addressed;*
 - *Fire/flame spread - not mentioned;*
 - *Ground stability - not mentioned;*
 - *Lightning - not mentioned;*
 - *Falling objects - not mentioned;*
 - *Ice throw - only addressed to workers - not to the public;*
 - *Public access - addressed;*
 - *Site security and signage (for vehicles) - addressed.*
46. In the **2006 ES addendum** [CD2B], Health and Safety are demoted to a sub-section under Section 14 "Other Issues". The subject of Shadow Flicker is addressed separately under Section 10.

47. Section 11.4 "Health and Safety" offers little more than already contained in the 2004 ES. The three additional sentences and four additional bullet points concentrate on on-site works, construction regulations, and site security restrictions to prevent vandalism and unauthorised access. Not one of these additional statements addresses safety to the public off-site (for example nearby residents and road users).
48. Section 10 "Shadow Flicker" attempts to address the risk from Shadow Flicker to those living within 10 turbine diameters (800m) of the proposed turbine locations.
49. Only 9 properties are considered, yet there are 15 properties within 800m of proposed turbine locations [CWAG/025 Table 1]. Properties not considered include 4 Stempster Holdings, Stempster Barn, The Old School House (Shebster) and The Old Manse (Shebster). Barnaheigh farmhouse and cottage are excluded on the grounds that they do not have unobstructed views of the proposed turbines.
50. Although not mentioned in the ES, it is assumed that assessment for 4 Stempster Holdings and Stempster Barn would be as that for 3 Stempster Holdings as they are in very similar locations. That leaves The Old School House and The Old Manse at Shebster still requiring assessment.
51. These properties lie south of the turbines, so as far as Shadow Flicker is concerned, they should not be affected. However, "Blade Glint" which is the reflection of light from the blades and similar to Shadow Flicker, is applicable to properties south of the turbines within 10 rotor diameters.
52. Failure by the developer to undertake assessment of the "Blade Glint" to any of the properties within 800m is poor and raises significant uncertainties regarding health effects to residents within those properties.
53. The **2007 ES addendum** [CD2C] concentrated solely on Peat Slide. This addressed the ground stability issue regarding construction of the turbines on peat, but did not fully address ground stability of the turbine in all weather conditions.
54. With regard to the specific public safety issues recommended to be addressed in the BWEA guidelines [CWAG/021], the following apply with respect to the data presented in the 2006 ES addendum [CD2B] and 2007 ES addendum [CD2C]:

- *Turbine/structural integrity - partly addressed;*
 - *Fire/flame spread - not mentioned;*
 - *Ground stability - partly addressed;*
 - *Lightning - not mentioned;*
 - *Falling objects - not mentioned;*
 - *Ice throw - only addressed to workers - not to the public;*
 - *Public access - addressed;*
 - *Site security and signage (for vehicles) - addressed.*
55. Shadow flicker appears to have been addressed, though as noted above no consultation with the public or local health providers appears to have been undertaken regarding those suffering from epilepsy. Epilepsy can be triggered by Shadow Flicker. At least one member of the public has confirmed in their objection letter that a resident suffers from epilepsy. The location is north of the turbines at a distance of 1050m. This has been ignored by the developers. By failing to engage with local health providers and the public this issue remains unresolved.
56. Additionally, as noted above, no assessment of Blade Glint has been undertaken, particularly to residents in houses to the south of the turbines. Uncertainties regarding health effects to residents within those properties therefore remain unresolved.
57. Lack of any consideration regarding operational safety performance with respect to members of the public
58. Failure by the developers to address this issue in the 2004 ES and 2006 ES addendum is discussed above.
59. CWAG/094 is the Scottish Ministers response to the developers 2003 Scoping Report for Baillie wind turbine site. This response included the following statement: *"The Environmental Statement should address safety factors such as blade throw and ice deposition"*
60. Blade Throw has not been specifically addressed anywhere in the 2004 ES or the 2006 ES addendum. Ice deposition (and it's consequences, ice throw) is mentioned in the 2004 ES, but has only been addressed to those on the site - not to members of the public.

61. The above are further shortfalls in the developers ES and addendum.
62. Lack of complete cumulative impact assessment for the area as requested by Statutory Consultees
63. Consultation responses to the 2004 ES included the statement for a requirement to include "*Potential cumulative effects due to a number of other wind farm proposals - both built, consented and subject to scoping*".
[CD2B]
64. It is noted that consented wind turbine sites plus those in planning at the time were taken into account in the 2006 ES. However, schemes at Scoping stage were not taken into account. This is a clear shortfall in the 2006 ES addendum.
65. It is also noted that in the revised cumulative assessment undertaken by Geddes Consulting in 2009 [BWL40], schemes at Scoping remain excluded, despite requests to include them in this revised assessment.
66. Failure to provide all relevant data for abnormal loads to be transported
67. Scottish Ministers advice to developers following submission of the Baillie scoping report included the following statement: "*Traffic and roads: 2.18 The Environmental Statement should consider... Types of vehicles and dimensions which would be used during construction*"
68. The 2004 ES [CD2A] considers transport under Section 11. Table 11.2 lists vehicle details and is reproduced below.

Table 11.2: Types of Vehicles Accessing Site During Construction

Type of Vehicle	Typical Dimensions (Length x Breadth)	Purpose
Semi-low extendable trailers		Delivery of Turbine Components
Mobile Crane Units		Delivery of Cranes to site
Low-loaders	17m x 2.5m	Delivery of plant, cables, transformers, etc to site
Concrete Mixer Trucks	8.4m x 2.4m	Concrete Delivery
20-tonne trucks	10m x 2.5m	Stone Delivery
Minibus / van	6.3m x 2.2m	Contractor transport
Private Cars	4.3m x 1.7m	Contractor Transport

69. As can be seen from the above, no numbers or weights of proposed loads or dimensions of turbine components or other abnormal loads were included. Additionally these fail to be included anywhere in the 2004 ES.
70. The 2006 ES Addendum considers transport under Section 11.5. It offers no new data on abnormal loads to that provided in the 2004 ES.
71. I believe that by failing to provide the above data, the developer has severely restricted the potential for proper assessment by Scottish Government and by Highland Council regarding the feasibility of transport along the proposed route.
72. Data for transport of nominal Baillie turbines and those of similar size already exists, yet developers have failed to provide it.
73. SSE propose the use of Vestas V80 turbines at the Strathy South wind turbine site. These are the same dimensions as proposed for Baillie. CWAG010 contains the transport section of their environmental assessment for this development. The following text and Tables 2.8 and 2.9 are taken from that ES.

TURBINE COMPONENTS

Information regarding the movement of turbine equipment and components has been provided by Wynns Independent Transportation Consultants Abnormal Indivisible Load Transportation Assessment of October 2004 and from Scottish & Southern Energy plc.

For the purposes of this report, the largest turbine suitable for the site is considered (the V80 Nacelle c/w 70m Towers and 40m blades). Its component parts are typical of its similar competitors, although it is slightly heavier. The components are identified in Table 2.8

Table 2.8: Turbine Components

Component	Number per turbine	Length (m)	Height (m)	Width (m)	Weight (te)	Notes
Foundation ring	1	5	4.1	4.1	5	Already included as a part of balance of deliveries
1 st tower section	1	16.7	4.1	4.1	49.7	
2 nd tower section	1	23.8	3.5	3.5	51.1	
3 rd tower section	1	24.4	2.8	2.8	39.5	
Nacelle	1	10.3	3.7	3.4	97	Including transport frame
Blade	3	40	4.7	2.55	9.2 te each	Transported 1 per load
Hub	1	3.4	3.2	3.4	23	

Table 2.9 indicates the likely vehicle characteristics for transporting each component, based upon details supplied by Wynns Transport.

Table 2.9: Indicative Component Transport Requirement

Item	Number	Mode of transport	Rigid length (m)	Overall length (m)	Overall Width (m)	Overall Height (m)	Load weight (te)	Overall weight (te)	No. axles	Max Axle weight (te)	Vehicle track width (m)
Foundation ring	77	Flat bed	13.6m	16.5m	4.26m	3.80m	10	44	6	10	2.5
1 st tower section	77	Extendable stepframe	26.8m	36.2m	4.1m	4.7m	49.7	76	7	13	2.5
2 nd tower section	77	Extendable stepframe	27.3m	32.6m	3.49m	4.19m	51.1	86	7	13	2.5
3 rd tower section	77	Extendable stepframe	24.5m	28.4m	2.8m	4.8m	39.5	62	7	12	2.5
Nacelle	77	Hydraulic platform or hydraulic low loader	1.5m or 26m	19.6m or 30.6m	3.4m	4.9m or 4.5m	97	130	11 or 10	14.1	3
Blade	231 (1 per load)	Extendable flat bed	41m	44.6m	2.55m	4.7m	19	65	6	13	2.5
Hub	77	Flat bed	13.6m	16.5m	3.4m	4.5m	23	38	6	8	2.5
Grid Transformer	2	Hydraulic platform or hydraulic low loader	1.5m or 24m	19.6m or 28.6m	4m	5.2m or 4.8m	77	107	11 or 10	14.1	3

74. The above extract from SSE's Strathy South ES shows that data on transport of similar-sized turbine components (Vestas V80 rather than the proposed Nordex N80) was available in 2004. Yet the Developers failed to provide it in their ES or addendum - even as an example.
75. This shows the ES to be deficient in terms of providing key transport data for proposed abnormal loads.
76. Errors in transport assessment
77. Section 11 of the 2004 ES [CD2A] contains a transport assessment based on a total number of 7,800 transports during one year of transport and construction operations. The 2006 ES addendum reiterates the same data.
78. Text in Section 11.5.3 of the 2004 ES states that additional stone may be sourced from Achscrabster Quarry. This would represent 12,740 vehicle movements in addition to those included in the overall construction traffic outlines in Tables 11.3, 11.4 and 11.5. Assuming that some suitable stone is available on Baillie site, 12,740 additional HGV movements from Achscrabster Quarry through the village of Bridge of Westfield to Baillie represents a worst case. However, not one additional HGV movement due to stone being transported from Achscrabster is included in the overall transport assessment. I would consider this to be unrealistic, and that a nominal value for some movements to/from Achscrabster should have been used in the transport assessment.
79. The transport assessment is therefore deficient in consideration of the number of HGV movements along the C1 road and at the site entrance.
80. The worst case would mean an additional 81 HGV movements at the site entrance per day - which added to the existing assessed figure of 40 gives 121 HGV movements per day in total. This is equivalent a 575% increase in HGVs at the site entrance. Or one transport every 5 minutes given a 10-hour working day.
81. Even if only 50% of the stone comes from Achscrabster, it would mean 80 HGV movements per day in total, equivalent to a 385% increase in HGVs per day at the site entrance. Or one transport every 7.5 minutes given a 10-hour working day.

82. I would question if the above scenarios are even feasible given the type of road (C class) and restrictions on HGV movements during daylight hours only.
83. SUMMARY of shortfalls in the Developers ES and addendum
84. The above demonstrates that the ES falls short in a number of areas, when compared to good practice demonstrated by other developers.
85. Shortfalls include:
- Developers failure to follow BWEA's Health and Safety Guidelines and advice regarding the Environmental Statement;
 - Developers lack of any consideration regarding operational safety performance with respect to members of the public;
 - Developers lack of complete cumulative impact assessment for the area as requested by Statutory Consultees;
 - Developers failure to provide all relevant data for abnormal loads to be transported;
 - Errors in transport assessment undertaken.
- 86. Distance to residential properties**
87. Unfortunately there is no mandatory minimum distance between wind turbines and residential properties. Scottish planning policy and guidelines fail to recommend any minimum distance, preferring instead for each development to be judged on a case-by-case basis, and for recommendations and decisions to be made by Local Authority Planning Committees, and decisions on S36 developments to be made by Scottish Ministers.
88. Reasons that wind turbines can be considered to be "too close" to residential properties vary, and include:
- Visual impact;
 - Impact on residential amenity;
 - Noise;
 - Increased risks to residents on safety grounds;

- Health effects.
89. Paragraphs below under this section "Distance to residential properties" are concerned with bullet points 1 and 2 above. Dick Bowdler will address bullet point 3 "noise". Bullet points 4 and 5 regarding safety and health effects will be addressed in subsequent sections in this precognition.
90. Table 1 lists the properties and groups of properties located within 1500m of the proposed turbine positions. There are 52 properties within 1500m of proposed turbine locations. One of these is a garage business – the remainder are residential properties, which are home to over 100 people.
91. The Reporter should note that all distances quoted below are subject to +/- 50m accuracy (BWL Statement of Case Planning Condition #2), hence turbines may be up to 50m closer to homes than are quoted in the text.
92. The data in Table 1 is summarised below:

Distance to nearest turbine (m)	Number of residential properties
200m to 350m	6
350m to 500m	0
500m to 750m	5
750m to 1000m	17
1000m to 1250m	16
1250m to 1500m	8
TOTAL	52

93. A further 21 properties lie between 1500m and 2000m of the turbines, giving a total of 73 properties within 2km.
94. It is noted that all properties within 350m of the proposed turbines may have some financial agreement with or incentives from the developer. This statement is largely based on the contents of support letters. However, of the residents within properties to 350m of proposed turbines, only Tom Pottinger (at Baillie Farm) and his wife are listed as shareholders for Baillie Wind Farm Limited. Indeed, they are the only shareholders listed north of Inverness.

95. In 2003, Scottish Ministers provided the following advice [CWAG/094] to the developers in response to the developer's 2003 scoping report [CWAG/093]. *"2.22 An appropriate separation distance on visual grounds from nearest residences needs to be assessed in the Environmental Statement. It should be noted at this stage that such distances are much closer than for other current proposals, and with larger proposed machines. A "rule of thumb"..... is that large wind turbines not associated to properties should be located no closer than 10 X total turbine height to properties."* [source CWAG/094].
96. That advice by Ministers was provided five years ago and has been ignored by the developer.
97. Following the "rule of thumb" and given a turbine height of 110m to tip, properties should be no closer than 1100m from turbines. Table 1 shows that there are 38 properties within that distance of turbines.
98. The document [Highland Council report PDET65/02, September 2002] which refers to the "rule of thumb" above, also recommended a 5km to 10km distance between individual windfarms, in order to avoid proliferation. This would effectively rule out Baillie due to the proximity of the existing Forss windfarm (6 existing turbines and 7 further turbines being discussed with Council, 3.4km distance). Recommendations from this report were not adopted as policy, but nevertheless, capture the suggestions of senior Highland Council officials in the absence of any prescriptive National guidance.
99. The Highland Renewable Energy Strategy (HRES) [CD10] was approved by Highland Councillors in May 2006 after significant public consultation. One of the aims of this strategy was to provide a clear strategy and guidelines for wind farm developers, with areas across the Highland Region clearly marked for and against development. Specific siting strategy and guidelines for wind farm developments over 50MW (S36 or national/major projects) were clearly stated. Part of the reason for HRES was to replace Highland Council's previous "rule of thumb" and to keep large wind farm developments away from residential properties.
100. Highland Council considers HRES to form a material consideration in the determination of relevant planning applications. Indeed, I believe that

Highland Council were one of Scotland's leading planning authorities in this respect, with SPP6 (published 10 months later) stating *"planning authorities may consider it helpful to introduce zones around communities as a means of guiding developments to broad areas of search where visual impacts are likely to be less of a constraint"*. This is exactly what HRES does in terms of outlining areas presumed for and against development. Ian Kelly will address this in more detail.

101. The West Caithness area in which Baillie is proposed is clearly marked as an area with "presumption against development" for S36 schemes. The Baillie scheme is therefore not compliant with HRES.
102. HRES states that in areas with presumption against development *"any proposals for national/major projects will have to overcome a precautionary approach to planning approval"*
103. A precautionary approach would see developers rigorously collecting and assessing data for this development, in order to gain and guarantee confidence in data for the development and hence reduce risks to those living in nearby residences. That is the precautionary approach.
104. This approach has not been used by the developer. Only the minimum data required has been submitted by the developer, and where uncertainties exist in that data, additional existing data has not been used in order to reduce those uncertainties and hence risks.
105. A good example of this is that existing ornithological data for the area was completely ignored by the developer, who chose instead to employ one person to undertake bird observations across a 565ha (5.65km²) site.
106. The site is reasonably busy with bird activity. The three vantage points used to cover the entire site meant one observer had to record observations over distances of over 3.5km from each vantage point, and also accurately record simultaneous flights. As a result flights will have been underestimated. No allowance for this error has been made in the collision model, nor has existing and extensive data from previous studies in the area been used to mitigate against these errors. The developer was aware of this existing data and indeed had made use of it in the earlier 1994 Environmental Statement for Baillie wind farm [CWAG/092]. RSPB and Stan Laybourne will cover this in more detail. My point is that

- the approach used demonstrates that the precautionary principle has NOT been applied.
107. HRES Table G4.2.3: Specific planning requirements and guidance for onshore wind development states the following in relation to proximity to dwellings *"if the project is classified as major or national then the proposed minimum distance for separation will be 1km, and there will be a presumption against developments where this cannot be achieved"*. Table 1 shows that there are 28 residences within 1km of proposed Baillie turbines, therefore the development is not compliant with HRES.
 108. Under the title "Communities", SPP6 states that *"Scottish Ministers would support (2km) as a separation distance between turbines and (communities)"* but caveats that developments may be permitted within this distance and those will be judged on a case-by-case basis.
 109. The area around Baillie is certainly a community, with 73 houses within 2km of the proposed turbines, and over 200 houses, a garage, hotel, B&B, post office and many farms dispersed across approximately a 5km radius. Given previous comments by Scottish Ministers regarding proximity to housing [CWAG/094], and Scottish Ministers generic support for a 2km separation distance in SPP6, it would appear that the proposed Baillie turbines are indeed too close to residential properties and to the surrounding community.
 110. Practices in other countries are moving toward a recommended minimum separation distance between residential properties and wind turbines. This is also referred to as a "setback" distance. Distances varying from 1km to 10km have already been recommended by a number of professionals and professional bodies, largely on grounds of health and noise. Appendix 1 lists these references. There are already calls in the UK to follow the example of some European countries and have a 2km separation distance between turbines and residential properties.
 111. CWAG/025 Figure 1 illustrates the increase in typical wind turbine size over the past 20 years.
 112. As turbine sizes increase, it is argued that logically separation distances from occupied dwellings should also increase. As a "rule of thumb", 1000m remains the minimum separation distance for many professional

- developers, including Scottish Power [CWAG/090]. This also remains as a recommended guideline for some Local Authorities, including Highland Council.
113. I would ask the Reporter to note the lack of any prescriptive separation distances to occupied dwellings in the National policy and guidance, and the knock-on effect of this, which has resulted in some previous minimum guideline distances being been withdrawn, as is the case with Highland Council. I would suggest that previous guidelines of 1000m are an acceptable guide of minimum good and safe practice, given the fact that much larger turbines are in use now than when the guideline was first used (in 1995).
114. Baillie Wind Farm Limited's Statement of Case states *"There are other consented windfarms in Scotland which are located in similar or closer proximity to dwellinghouses"*. While this may be true, most professional organisations and individuals learn from their past mistakes. Members of the public whose lives have been severely impacted through turbines being constructed too close to their homes is discussed later in this precognition - at distances from 300m to 2km from turbines. I would suggest that the above statement by the developers shows an attitude of irresponsibility, or a failure to understand or care about - the issues concerned.
115. Safety incidents and press coverage featuring residents suffering from health problems, noise issues, and other known issues from living too close to wind turbines does not do the BWEA or its members any favours. Sections on safety and health effects (below) will demonstrate existing problems from turbines which have not been adequately assessed and have been erected too close to residential properties. It is precisely these issues which an appropriate setback distance, combined with appropriate assessment and taking uncertainties into account, should address.
116. Recommendations for appropriate setback distance already exist. These are discussed further in this precognition.
117. In SUMMARY, I would suggest to the Reporter that Bailie turbines are unacceptably close to residential homes. I would also ask the Reporter to

consider, given the above evidence, whether it is acceptable to breach previous policy and practice guidelines with much larger turbines than considered previously at closer distances to residences. I would suggest that it is not acceptable to do so.

118. Safety Issues

119. Accidents happen in any industry and the wind industry is no exception. The BWEA keeps its own list of accidents and near misses and – as with any responsible organisation - strives to improve its safety performance and to reduce risks to its workers and to the public by taking on "lessons learnt" from past accidents. This is usually undertaken by changing practices, through learning from past mistakes.
120. The BWEA accident and near miss database is not a public document, hence that data cannot be accessed for this PLI. As an alternative, a summary of wind turbine accidents published by the Caithness Windfarms Information Forum (CWIF) has been used as an example of the types and impact of wind turbine accidents for this PLI [CWAG/022].
121. The wind turbine accident database began in 2003, and by the end of 2008, had grown to a detailed list of 560 wind turbine accidents world-wide. Each accident listed is fully auditable back to its source via at least one reference. This accident database is updated quarterly and has received praise from many organisations world-wide, and also UK Government professional safety advisers [CWAG/096]. It is therefore offered here as an auditable and recognised database which includes examples from and impacts of all types of wind turbine accident which have appeared in the press.
122. It is acknowledged that this data is not fully comprehensive – it is difficult to obtain details of every wind turbine incident world-wide – but CWIF believe that it may be the most comprehensive wind turbine accident record available anywhere.
123. A SUMMARY of accident data from Reference CWAG/022 will now be given.

124. Accident trend.

125. The summary table below illustrates numbers of wind turbine accidents per year to the end of 2008.

Year	70s	80s	90-94	95	96	97	98	99	00	01	02	03	04	05	06	07	08
No.	1	8	17	5	9	16	8	33	28	11	64	49	50	49	48	72	82

126. CWAG/025 Figure 2 shows a clear correlation in numbers of accidents increasing over time.

127. The trend is as expected – the more turbines, the more accidents. There is a general trend upward in accident numbers over the past 10 - 15 years. This is predicted to escalate as turbine number increase unless HSE make some significant changes – in particular to protect the public by declaring a minimum safe distance between new turbine developments and occupied housing and buildings, and declaring “no-go” areas to the public, following the 500m exclusion zone around operational turbines imposed in areas of France.

128. Comparison of above with BWEA database

129. Access to the BWEA Health and Safety database is restricted. However, some data is available for comparison to the above CWIF figures.

130. At the fourth BWEA Health and Safety Seminar held in Manchester on 29 January 2008, it was reported that the "*5th quarterly report was issued on 25 January 2008*" and that the database contained "*analysis of 372 reported incidents - 112 since the last period*" Reference available at: <http://www.taplondon.co.uk/bwea/pdf/session1/DF%20BWEA%20HS%20Steering%20Grp%20summary%20update%200108.pdf>

131. I have written to BWEA's Rod Blunden requesting whether the 112 incidents "since last period" refers to 112 incidents in one calendar quarter (in line with reports) or in one calendar year. I have not received a reply.

132. What the figure of 112 reported UK incidents in 2007 reveals - either in one quarter or in the year - is that the CWIF figure of 72 incidents world-wide in 2007 - of which 20 are recorded in the UK - is far short of the mark in terms of total numbers of actual incidents.
133. The CWIF data is therefore a vast under-representation of the number of incidents which have occurred. However the data remains representative of the types and consequences of incidents which can and do occur.
134. Accident types.
135. CWAG/025 Figure 3 summarises the types of typical accidents recorded in CWAG/022. In summary, these are:
- Blade failure 29%
 - Fire 23%
 - Structural failure 13%
 - Ice throw 5%
 - Transport (non-fatal) 8%
 - Environmental 10%
 - Miscellaneous 12%
136. Thus the most common types of accident are blade failure and fire. Both these types of accident can have impacts and consequences over large areas, well away from the general region around the turbine. These are the key types of accident which can impact on residential properties if they are located too close to turbines.
137. Fatal accidents.
138. To end 2008, a total of 57 fatalities have occurred in the wind industry or associated activities (e.g. turbine component transport). Of the 57 confirmed deaths worldwide, 41 have occurred to service personnel and support workers. The remaining 16 fatalities have been of members of the public – the majority being from road and transport accidents. Two suicides are also included.
139. Two of the fatalities occurred in the UK.

140. The point here is that the wind power industry is much the same as any industry with large industrial sites. It is not as safe as many developers would have us believe.
141. Human injury.
142. To end 2008, a total of 29 human injuries have been recorded. Twenty-one accidents involved wind industry or construction/maintenance workers, and a further eight involved members of the public: one lost a leg in a transport accident, two were hit by thrown ice, one suffered spinal injuries from a falling turbine part, one fell from 100 metre tower during an accompanied visit, one was injured but survived a fatal crash with a turbine transporter which killed his wife, one flew his aircraft into a wind turbine site, and one had a “near miss” crashing his paraglider near turbines. Three of these injuries to members of the public were in the UK.
143. Blade Failure.
144. To end 2008, 139 separate incidents of “blade failure” have been recorded. “Blade failure” can arise from a number of possible sources, and results in either whole blades or pieces of blade being thrown from the turbine. Blades can be broken in a number of ways: they can bend and hit the tower, they can be struck by lightning and shatter, they can suffer physical failure either from poor manufacture or from too much stress through sudden wind gusts. The result of the most catastrophic blade failure is the loss of a whole blade or very large blade part, but the worst potential risk to the public will occur when a blade is shattered and medium-sized pieces travel hundreds of meters over a wide area. CWAG/022 documents pieces of wind turbine blade travelling over 500m, typically from much smaller turbines than those proposed for use at Baillie. In Germany, blade pieces have gone through the roofs and walls of nearby buildings. Properties and residents which are too close to turbines are at risk from blade failure.
145. Paul Gipe, a wind turbine enthusiast and renowned writer on renewable energy, provides further information on a blade failure incident in his book “*Wind Energy -- The Breath of Life or the Kiss of Death: Contemporary*

Wind Mortality Rates”, where on the island of Samso, Denmark, a blade section was thrown through a window into an indoor swimming pool. Fortunately, it was unoccupied at the time. Gipe acknowledges that “as turbines become larger, the consequences of such catastrophic failures as throwing a blade raises the stakes for the public at large.”

146. Fire.

147. Fire is the second most common accident type for wind turbines, with 110 incidences recorded to the end of 2008. The biggest problem with turbine fires is that, because of the turbine height, the fire brigade can do little but watch the fire burn itself out. While this may be acceptable in reasonably still conditions, in windy conditions it means burning debris being scattered over a wide area, with obvious consequences. In dry weather there is obviously a wider-area fire risk, especially where turbines are constructed in or close to forest areas and/or close to housing.

148. Structural failure.

149. Structural failure is the third most common cause of wind turbine accident, with 60 incidents recorded to the end of 2008. Structural failure is considered to be toppling of the rotor, tower collapse, destruction of the turbine through high winds, metal fatigue, the nacelle/tip falling off, and catastrophic failure of the supporting tower. While these accidents appear catastrophic, they pose less of a risk to the public in the Baillie setting compared to ice throw, fire and blade failure. Photographs of such catastrophic failure shatter the myth of the wind power industry as safe and benign.

150. Ice throw.

151. 24 incidences of “ice throw” have been recorded to the end of 2008, of which two resulted in human injury and a further two resulted in damage to personal property. One of the fatal accidents listed involved a wind industry worker who was cut in half by falling ice. While these detailed accidents give a representation of the types of accident which can occur when ice is formed then thrown from turbine blades, the numbers do not

represent the frequency of ice occurrence. One reference alone (*A Statistical Evaluation of Icing Failures in Germany's '250 MW Wind' Programme – Update 2003, M Durstwitz, BOREAS VI 9-11 April 2003 Pyhäntunturi, Finland*) reports 880 separate icing events in Germany alone from 1990 to 2003. While 67% of these were in the mountain region, the remaining 33% occurred on the coastline and in lowland regions, which are similar to the Baillie situation. Operators claim to shut down turbines in the case of icing, but as immediate shutdown of turbines is impossible, blades will always be turning when ice is detected. CWAG/022 documents ice throw up to 550m with pieces landing at up to 170 mph from smaller turbines than those proposed for Baillie. Recently, ice throw has been reported in the south of England, with pieces landing in the car park of a Cambridge carpet store in December 2008. Researchers into the subject acknowledge ice throw to be “an important safety issue” and can pose “a significant safety risk” [CWAG/023].

152. If ice throw of 550m can be achieved from smaller turbines than those proposed for Baillie, I would suggest that there is a real risk of ice throw over a further distance than that already reported. There are 7 houses within 550m of turbines at Baillie. In addition, the Achreamie to Shebster road, and the Isauld to Westfield road (a national cycle route) both fall within 550m of the turbines. Both routes are also school bus routes.
153. The Baillie turbines therefore pose risk from ice throw to residents and also to drivers and cyclists on the nearby roads.
154. Miscellaneous accidents.
155. Miscellaneous accidents include accidents which cannot be grouped with others, and are often due to human errors including poor maintenance, faulty workmanship and poor supervision. However, these incidents are typical industrial accidents which one would expect from an established industry. Consequences of these miscellaneous accidents to the public are low.

156. Wind industry guidelines.
157. Generally, the wind industry has learned from past mistakes and now seek to protect its workers from unnecessary risk. Vestas are a major manufacturer of wind turbines, and one of their current models is the Vestas V90, a 3-MW turbine of similar dimensions to those proposed for Baillie.
158. In the operation and maintenance manual for this turbine [CWAG/024], Vestas offer the following advice to their staff *“Do not stay within a radius of 400m (1300ft) from the turbine unless it is necessary. If you have to inspect an operating turbine from the ground, do not stay under the rotor plane but observe the rotor from the front.”*
159. Vestas should know what they are talking about. If this is suitable advice for Vestas employees, then I suggest that the public should be offered the same advice and safeguards. Given that there are 6 houses within 400m of the proposed Baillie turbines, it would appear that even the Wind Industry are implying that those houses will not be safe once the turbines are erected.
160. Discussion and summary.
161. Developers appear reluctant to admit to accidents at all. In his book *“Wind Energy -- The Breath of Life or the Kiss of Death: Contemporary Wind Mortality Rates”*, Paul Gipe reports that *“At the European Wind Energy Conference in Nice in 1999, the halls were a buzz with the news that several megawatt turbines had “lost” a blade in Germany. The manufacturers of the turbines were understandably uncomfortable even acknowledging that the events actually happened.”* Gipe is a very experienced wind energy industry commentator and supporter and his views should be taken seriously. If developers take this attitude within their own industry and with accidents which have already happened, I would question whether potential risk data produced by developers can be trusted at all.
162. From the above it can be seen that the wind power industry has potential for a variety of accident types, and that there is relatively limited data available for accidents which have occurred to date. Many of the accident

types, as outlined in CWAG/022, are applicable to the proposed development at Baillie, with the highest risk to the public and to workers in the area from accidents involving ice throw, blade failure and fire. There is no doubt at all that if these turbines are constructed at Baillie then unacceptable and unnecessary risks will be introduced to the public and to workers in the area. These risks to the public can only be avoided completely if the turbines are subject to appropriate setback distances from housing and from local roads. Current setback distances are completely unacceptable. This is further discussed in subsequent sections of this precognition.

163. Potentially adverse health effects

164. How widespread are these adverse health effects?

- 165.** Adverse health effects from wind turbines has been recognised by medical professionals and academics for over 10 years. In 1998, a group of around one hundred German professors wrote and published the "*Darmstadt Manifesto*" partly due to their concerns of the effects of wind turbines on human health. Recognised medical symptoms included "*headaches, migraines, nausea, dizziness, palpitations, tinnitus, sleep disturbance, stress, anxiety and depression*" (*German Professor's Initiative Group - Darmstadt Manifesto, 1998*).
166. Perhaps understandably the Wind Industry is yet to recognise that these medical effects are as a result of living too close to wind turbines.
167. In the past few years, medical effects upon human health as a result of living too close to wind turbines has become a world-wide issue. The UK's Dr. Amanda Harry has published a number of reports on the issue, including her 2007 report "*Wind Turbines, Noise and Health*" [CWAG/032]. Also in the UK, Barbera J Frey and Peter Hadden published a detailed report "*Noise radiation from wind turbines installed near homes: effects on health*" [CWAG/035].
168. In the USA, Dr. Nina Pierpont is to publish a book and has published a number of articles from that book, including "*Health effects of wind turbine noise*" [CWAG/030] and "*Wind Turbine Syndrome: Noise, shadow flicker*

and health" [CWAG/031].

169. The pre-publication of Dr. Pierpont's 2008 book "*Wind Turbine Syndrome: A Report on a Natural Experiment*" reported studying 10 families living near wind turbines in Canada, England, Ireland, Italy and the United States. Of the ten families studied between 2004 and 2008, eight had fled their homes because of the health effects. All reported less severe symptoms at that point, she reports in the book.
170. In France, the National Academy for Medicine produced a report which translates as "*The effects of wind turbine operations on human health*" [CWAG/033]. In December 2008, the US-based National Wind Watch carried a special article "*Looking into the noise about wind turbines*" [CWAG/034].
171. As of February 2009, a Japanese newspaper report in Asahi Shimbun (<http://www.asahi.com/english/Herald-asahi/TKY200902060054.html>) quotes 70 Japanese incidences of ill-health near wind turbines at five separate locations.
172. Also at February 2009, several articles in the Canadian Press call for further studies and for greater setback distances from turbines. (<http://www.theobserver.ca/ArticleDisplay.aspx?e=1431388> and <http://simcoereformer.ca/ArticleDisplay.aspx?e=1423298&auth=Daniel%20Pearce,%20SIMCOE%20REFORMER>)
173. Again in February 2009, medical staff in Maine, USA have called for a moratorium on construction of wind farms near properties on health grounds (<http://www.windaction.org/documents/19933>) and in Texas, USA, an inquiry is underway regarding residents ill-health from wind turbine noise (<http://www.jacksboronewspapers.com/news/get-news.asp?id=11407&catid=1&cpg=get-news.asp>)
174. Between them, these articles describe the effects on human health from wind turbines in:
- England;
 - Wales;
 - Ireland;
 - Sweden;

- Denmark;
 - France;
 - Germany;
 - Portugal;
 - Italy;
 - Canada;
 - United States;
 - Australia;
 - New Zealand;
 - Japan.
175. This extensive world-wide record of health problems demonstrates that this is not a unique phenomenon. Nor is it isolated, or confined to one group of people, or to one type of turbine, or one type of location.
176. This is real and widespread. All over the world, people are suffering ill-health as a result of living too close to wind turbines.
177. This is recognised by academics, researchers, medical professionals, and others.
178. The only way to mitigate against these effects is to have a sensible and responsible setback distance between wind turbines and residential homes. In Scotland, this has to be agreed by Scottish Ministers.
179. What are the causes of these adverse health effects?
180. Although adverse effects on human health from wind turbines is reasonably well documented, the cause of some of the adverse effects is not clear. Known effects are described below:
- Shadow flicker – this occurs when large rotating blades cast moving shadows which can fall on persons or dwellings and cause a flickering or strobing effect;
 - Blade glint – this is also referred to as blade flash or flashing, and is caused by the reflection of sunlight from gloss surfaced light toned blades;
 - Audible noise – this is noise which can be heard from the turbines, and arises both from mechanical noise from the

turbine, gearbox, bearings and other mechanical equipment, and also from the noise of the turbine through the wind and the air displacement as the turbine passes the tower – this is commonly known as “thump” or “tower thump”, and also as aerodynamic noise;

- Low Frequency Noise – also referred to as LFN. This is noise which is below the frequency of human hearing. People claim to “feel” LFN rather than hear it. A report produced by DEFRA's technical consultants "*Low Frequency Noise – Technical Research Support for DEFRA Noise Programme – Castella Stanger, 2001*" acknowledges "wind farms" to be a source of LFN.

181. Researchers now agree that it is a combination of the above causes which results in what Dr. Nina Pierpont has described as "Wind Turbine Syndrome".
182. Symptoms, research, findings and recommendations regarding adverse health effects from living too close to wind turbines
183. Community-based general practitioners are often the first to detect patterns of symptoms described by their patients. In 2003, Cornwall's Dr Amanda Harry first noted that patients began complaining of poor sleep, headaches, stress, and anxiety [CWAG/032]. Further discussion with one couple revealed that their health problems coincided with the commissioning of wind turbines situated approximately 400 meters from their home. Their symptoms were relieved when they were away from their home, and from the wind turbines. Their symptoms occurred when the wind blew in certain directions: the noise was sometimes so disrupting that they would go to a nearby bed and breakfast, just far enough away to sleep undisturbed.
184. As a result of her initial observations, Dr Harry investigated further, finding that physicians in countries including New Zealand, Australia, France, Germany, Netherland and the USA had noted a similar "cluster" of symptoms in areas where people lived close to wind turbines. Dr Harry's

research involved people from a number of sites near wind turbines across the UK.

185. Following this initial research, Dr. Harry undertook her own independent pilot study using 42 people living between 300m and 2km from wind turbines in the UK. Her questionnaire included questions on:

- Age;
- Occupation;
- Location;
- Distance from turbine;
- Length of time living at the property;
- Do you feel your health has altered since erection of the turbines;
- (If yes to previous question) Have you experienced any of the following symptoms (more than prior to erection of the turbines);
- If you have experienced symptoms, have you approached your doctor regarding these symptoms - and have you received treatment of any kind;
- Do you feel that your quality of life has altered as a result of the wind turbines, and if "yes", how?

186. Symptoms reported included those reported from those living close to other wind turbines sites, including:

- Headaches;
- Palpitations;
- Excessive tiredness;
- Stress;
- Anxiety;
- Tinnitus;
- Hearing problems;
- Sleep disturbance;
- Migranes;
- Depression.

187. The main results from this research are:

- 81% of the respondents reported that their health had been affected;

- 76% of the respondents felt that the effects had been severe enough to consult their doctor;
- 73% of these respondents reported that their quality of life had been adversely impacted.

188. Dr Harry's inquiries led her to conclude:

- *'There are people living near turbines who are genuinely suffering from health effects from the noise produced by wind turbines. These neighbours of turbines clearly state that at times the noise from turbines is unbearable. The developers are usually heard to say that noise is not a problem. Clearly this cannot be the case.'*
- *'Some of these acoustic experts have made statements categorically saying that the low frequency noise from turbines does not have an effect on health. I feel that these comments are made outside their area of expertise and should be ignored until proper medical, epidemiological studies are carried out by independent medical researchers.'*

189. As a result of her research, Dr Harry concluded that wind turbines should be sited not less than 1.5 miles (2.4 km) from the nearest home or residential facility.

190. Parallel work on the same subject (around the same time) was carried out in the United States by Dr. Nina Pierpont.

191. Dr. Pierpont reports that *"In Lincoln Township, WI, a University of Wisconsin survey of residents near a 22 turbine installation in 2001, 2 years after construction, documented that 44% of residents 800 ft to ¼ mile from the turbines found noise to be a problem in their households, 52% ¼ to ½ mile away, 32% ½ to 1 mile away, and 4% 1 to 2 miles away. Under certain conditions the turbines could be heard up to 2 miles away."* [CWAG/031].

192. For the same turbine installation, Dr. Pierpont also reports that *"two years after installation of 22 industrial wind turbines, 33% of residents 800 ft to ¼ mile from the turbines found shadows from the blades to be a problem,*

- 40% ¼ to ½ mile away, 18% ½ to 1 mile away, and 3% 1 to 2 miles away." [CWAG/031].
193. Dr Pierpont also notes that these results agree well with other published data from the Netherlands *"numbers correspond well to measurements made by Dr. GP van den Berg of the University of Groningen in the Netherlands near a more recent 30 MW, 17 turbine installation on the Dutch-German border, where residents living 500 m (1640 ft, or 0.31 mile) and more from the turbines"* [CWAG/031].
194. And also from with published data from France *"In a 2005 survey of 200 adult residents within ¾ mile of the French St. Crepin Windfarm, 83% responded. Of these, 27% considered the noise to be intolerable at night, 58% considered the noise to be disturbing, and 10% considered the noise to be disturbing by day. This is only a 6 turbine, 9 MW installation."* [CWAG/031].
195. In a separate publication [CWAG/030], Dr. Pierpont describes the effects of noise-induced sleep disturbance which apply to wind turbines. *"Wind turbine noise, as described above and experienced by many turbine neighbors, is easily within the decibel levels to disturb sleep. Effects of noise-induced sleep disturbance include fatigue, depressed mood or well-being, decreased performance, and increased use of sedatives or sleeping pills. Measured physiologic effects of noise during sleep are increased blood pressure and heart rate, changes in breathing pattern, and cardiac arrhythmias. Certain types of night time noise are especially bothersome, the authors note, including those which combine noise with vibration, those with low-frequency components, and sources in environments with low background noise. All three of these special considerations apply to industrial wind turbines in rural NY State."*
196. Dr. Pierpont concludes that *"To protect the public health, it is critical that industrial wind turbines not be placed within a minimum of 1.5 miles of human dwellings (homes, hospitals, residential schools, nursing homes, prisons, etc.) or schools. In mountainous terrain the setback should be greater, especially in topography with long parallel ridges and valleys as in the Appalachians."* [CWAG/030].

197. In France, the National Academy of Medicine published "Le retentissement du fonctionnement des éoliennes sur la santé de l'homme" (*The effects of wind turbine operations on human health*) in March 2006.
198. The French report [CWAG/033] notes a similar situation to that in the UK - that is that there is no mandatory minimum distance between wind turbines and houses, and that noise regulations under which wind turbines are assessed date from 1995, and are now out-dated and inappropriate.
199. The report notes similar health symptoms to those reported by Dr. Harry and Dr. Pierpont, and attributes the majority of the cause to be from turbine noise. The report also notes that "shadow flicker" and "blade glint" can trigger epilepsy and were accountable for distractions which may lead to car accidents.
200. In conclusion, the French National Academy of Medicine recommended to the government that:
 - Construction of wind turbines with capacity exceeding 2.5MW closer than 1500m to housing should be suspended;
 - Noise regulations should be revised to take account of the industrial noise produced by larger capacity wind turbines.
201. "Noise Radiation From Wind Turbines Installed Near Homes: Effects On Health", [CWAG/035] published by BJ Frey and PJ Hadden in 2007, reviews much published work and information on the subject. Noise and associated health problems are reported from the following locations:
 - Askam, Cumbria (2004 to present);
 - Ireleth, Cumbria (2004-2006);
 - Marton, Cumbria (2004-2006);
 - Forestmoor turbine site, Bradworthy, Devon (2005 to present);
 - Bears Down turbine site, North Cornwall (2001 - 2003);
 - Toora turbine site, Victoria, Australia (2000-2005);
 - Te Apiti turbine site, New Zealand (2005 to present);
 - Unnamed turbine site, Nova Scotia, Canada (2005 to present);
 - Meyersdale turbine site, Pennsylvania, USA (2003 to present);
 - Mackinaw City turbine site, Michigan, USA (2002);
 - Blaen Bowi turbine site, Wales (2005);

- Fenner turbine site, New York, USA (2006);
 - Taurbeg, Cork, Ireland (2006 to present);
 - Deeping St Nicholas turbine site, Lincolnshire (2006 to present).
202. In the majority of the above cases:
- Complaints from residents were often ignored;
 - Developers claimed that it was a unique situation;
 - Developers claimed that their turbines were operating within the prescribed limits;
 - Developers passed the responsibility to Local Authorities;
 - Local Authorities were left to undertake measurements and investigation - at their own expense.
203. Also in the majority of the above turbine sites, noise and associated health effects remain unresolved, and continue to this day.
204. The main reason for this is that wind turbines have been constructed too close to homes.
205. Fray and Hadden conclude with the recommendations that *"The Government would be prudent to institute an immediate and mandatory minimum buffer of 2km between a dwelling and an industrial wind turbine, and with greater separation from a dwelling for a wind turbine with greater than 2MW installed capacity."* [CWAG/035].
206. The above clearly shows that - despite all the listed wind turbine sites apparently meeting appropriate planning regulations and guidelines - the issue of wind turbine noise and other effects to those living closely is a real issue. There are clearly uncertainties and unknowns in predicting wind turbine noise emissions - and also evaluation of other factors for example shadow flicker - using current methodology. In each of the above cases any boundary or cushion to deal with such uncertainty was clearly set too low. Given such uncertainties, a precautionary approach should have been applied, and developers failed to do that as there was no requirement to do so.
207. The reality for those featured in the Frey and Hadden report is that they "have to put up with" the situation until further measurements and tests can establish whether a "real" problem exists. Some of these

measurements and tests have been going on for years, and with no worthwhile outcome or resolution.

208. In 2005, the Reporter for the Borrowston Public Inquiry in Caithness concluded *"It does not seem to me that in an issue as fundamental as noise impacts on residential amenity it would be responsible, or fair to the affected households, to leave unresolved questions, and future observations of essential conditions, to further investigation after granting planning permission."* [CWAG/090].

209. Summary on wind turbine health effects

210. Health effects which are detrimental to those living close to wind turbines have been known about for over ten years. These health affects result even after developers and planning authorities have followed appropriate guidelines and methodology. Experience in such effects is world-wide, and is becoming more widespread as larger numbers of turbines are erected, and as turbine sizes increase. Medical professionals agree that the source of these effects are wind turbines, and that causes of these effects include turbine noise (all frequencies), shadow flicker and blade glint. Medical professionals also agree that the only mitigation possible is to have an appropriate "setback distance" between turbines and residential homes and other occupied buildings. Suggested setback distances vary, and are discussed further in this precognition. Current setback distances from proposed Baillie turbines are completely unacceptable.

211. Human Rights

212. The European Human Rights Act, Article 8, provides that *"there should be no interference by Public Authority with private or family life, home and correspondence except in accordance with the law and as is necessary in a democratic society in the interests of national security, public safety or economic well being of the country, to provide disorder or crime, to prevent health or morals or for the protection of the rights and freedom of others"* [CWAG/095]. Given the above safety and health information, if

the Baillie wind turbine facility is approved, it may well be in breach of the above Act. At least one case already exists in which wind turbine developers have been taken to the European Court of Human Rights.

213. BJ Frey and PJ Hadden also examined human rights [CWAG/035] and concluded that:

- it is the responsibility of the decision makers to ensure compliance with Policy, Regulations and Guidelines;
- In parallel it is also the responsibility of decision makers to establish beyond reasonable doubt that families rights to respect for their amenity (i.e. their private lives and enjoyment of their homes and garden) is not violated;
- If decision makers decide that the public interest in building wind turbines is greater than the individuals private interests, then the violation is not proportionate without compensation for the individual(s).

214. As decision makers in this case, Scottish Ministers are reminded of their obligations to the residents in the Baillie area as outlined above.

215. Recommended setback distances

216. The need for setback distances between wind turbines and residential turbines has already been discussed both for safety reasons and in order to avoid ill-health effects in those living close to the turbines.

217. As mentioned above, there is no minimum setback distance between wind turbines and residential properties either in Scotland or in the UK. Instead, planning authorities are requested to judge each proposed wind turbine site on a case-by-case basis. I believe that this approach has led to anarchy with respect to wind turbine developments. Additionally, local planning authorities face an increasing number of wind turbine applications in the planning system, yet are expected to undertake the assessment work with reduced budgets and in many cases with reduced numbers of staff.

218. One way to reduce the workload on local authorities, and to provide the public with reassurance that their health and safety was being appropriately managed, would be to consider a minimum setback distance between wind turbines and residential properties.
219. Many organisations have already carried out significant amounts of work on this topic. Appendix 1 lists the main references for that work. The table below summarises the overall results, in order from those listed in the Appendix.

Organisation/body	Location	Role/status	Recommendation	
			Imperial	Metric (m)
Logan and Kaplan, Energy policy advisors	USA	US Congress Recommendation for Policy	3281 feet	1,000 m
Canadian Ministry of the Environment	Canada	National Guideline	3280 feet	1,000 m
Rock County, WI	USA	Local Authority recommendation	2640 feet	805 m
Union Township, WI	USA	Local Authority recommendation	2640 feet	805 m
Blair County, WI	USA	Local Authority recommendation	2500 feet	760 m
Potter County, PA	USA	Local Authority recommendation	2900 feet	885 m
Town of Allegany, NY	USA	Local Authority recommendation	2500 feet	760 m
Town of Lyme, NY	USA	Local Authority recommendation	4500 feet	1,370 m
G Kamperman et al, acoustic consultants	USA	Presentation to NOISE-CON 2008 - recommendation	3280 feet	1,000 m
National Academy of Medicine	France	Medical professionals - Recommendation		1,500 m
Trempealeau County, WI	USA	Local Authority recommendation	1 mile	1,600 m
Washoe County Planning Commission, NV	USA	Local Authority recommendation	1 mile	1,600 m
National Wind Watch	USA	Pressure group recommendation	1 mile	1,600 m

UK Noise Association	UK	Campaign group press release -recommendation	1 mile	1,600 m
Beech Ridge Wind Farm	USA	Developer recommendation	1 to 4 miles	1,600 m to 6,400 m
Fayette County, PA	USA	Agreed setback between local authority, developer and landowners	1.1 miles (6000 feet)	1,800 m
BJ Frey and PJ Hadden	UK	Consultants - recommendation on health effects and human rights	1.2 miles	2,000 m
UK Noise Association	UK	Campaign group -2006 report with recommendation	1 to 1.5 miles	1,600 m to 2,400 m
Press report	USA	Refers to consultants recommendations on health grounds	1 mile	1,600 m
Dr. N Pierpont	USA	Medical professional - health grounds	1.5 miles	2,400 m
Dr. A Harry	UK	Medical professional - health grounds	1.5 miles	2,400 m
Riverside County, CA	USA	Local Authority recommendation	2 miles	3,200 m
Dr. M Villey-Migraine	UK	Medical professional - Advice to Welsh Affairs Select Committee	3.1 miles	5,000 m
Keele University	UK	Seismic professionals - recommendations to MoD, DTI and BWEA on erection of turbines near MoD's Eskdalemuir facility	6.2 miles	10,000 m

220. The above setback distance recommendations are largely on noise and health grounds. The final row above (Eskdalemuir) is a recommendation on military grounds and so is not appropriate for residential properties and will be ignored.
221. Ignoring the military reference, setback recommendations vary from 760m to 5,000m, with a mean recommended value of 1,735m from 23 separate recommendations.
222. Ballie residences lie as follows:

- 13 residences within 760m of proposed turbines, and;
- over 52 residences within 1735m of proposed turbines.

223. The Reporter and Scottish Ministers are asked to note the numbers of residences within those distances from turbines, and to note that these all lie at less than recommended setback distances by medical professionals and other bodies on health grounds.

224. I would suggest to the Reporter and to Scottish Ministers that the Baillie turbines are unacceptably close to residences given uncertainties which exist on noise and on health grounds. I would also suggest that Ministers cannot afford to take the risk regarding the health of local residents, and would suggest that on those uncertainties alone this proposal should be refused planning permission.

225. Transport

226. It has already been demonstrated that the Developer failed to adequately assess the transport aspects for this proposed wind turbine site.

227. The ES and addendum (CD2A, CD2B) failed to undertake the following:

- Data on dimensions of turbine components and other abnormal loads were not provided in the ES;
- Data on weights of turbine components and other abnormal loads were not provided in the ES;
- The ES table containing the summary transport data failed to include an additional 12,740 HGV movements which are likely to be required to supply stone from Achscrabster quarry to the site. These movements were included in the ES but hidden in text and did not appear in the summary data table;
- The transport assessment failed to include these HGV transports in its assessment of local impact.

228. The overall result of the above is that:

- Highland Council and Scottish Executive/Government were unable to assess the transport impact on local roads due to lack of critical data, and;

- Highland Council and Scottish Executive/Government were unable to assess the feasibility of the route in terms of bridge loading and loading of other road crossings (culverts etc) due to lack of critical data.
229. As a result of the above, the feasibility of the route has never been adequately assessed or proven.
230. The 2006 ES addendum [CD2A] included a swept path analysis for the three junctions proposed. These are the A9(T)-A836 junction, the A836-C1 Isauld junction, and the C1-Baillie site junction.
231. Impact on local residents at the Isauld junction
232. The swept path analysis clearly shows that the existing dyke adjacent to the Bridge of Isauld Cottage needs to be taken down during transport of turbine components from Scrabster. Drawing 011/B in Section 11 of the 2006 ES addendum [CD2B] clearly shows this, and that turbine sections will need to extremely close to property boundaries in order to manage round the junction. This situation would need to be maintained during the transport phase - which the ES confirms to be of 12 months duration. To minimise traffic disruption, transports are to be undertaken at night.
233. Three properties lie immediately adjacent to the route through the junction as shown. The nearest dwelling (house wall - not property boundary) lies only 9m from the proposed temporary road. Given that (a) transports are to be undertaken at night; (b) that this junction is likely to pose some difficulty to transport of turbine tower sections to 36m in length and to 4.1m in width, and also to blades at 45m long [CWAG/010 Table 2.9]; and (c) that this is a very quiet rural area, I would suggest significant disturbance of residents in these dwellings will occur during the 12 months of component transport.
234. Concerns regarding sleep disturbance have already been clearly expressed by one of the residents in these properties [CD4]. The letter says the following about the transport of abnormal loads during *"unsocial hours"* *"I am a very light sleeper and anticipate a range of health problems associated with this activity, not just myself, but my wife, 3 children currently living at home, also 4 dogs who will be woken up and will wake*

the rest of the family. I am happy to discuss this with any member of the project and make sure that they appreciate the misery they will be inflicting on one family in particular."

235. These concerns have been completely ignored by the Developers, who have offered no mitigation for that likely disturbance. Additionally, the Developers have failed to contact any of the residents to discuss their requirements and to undertake consultation.
236. Section 11.6.1 of the 2004 ES [CD2B] states that *"overhanging trees on the left side of C1 to the East of Isauld will be cut back"* as required mitigation. These are the mature trees at property "Quiet Waters". The owners of this property have had no consultation from the Developer or from Highland Council, and are very upset at the prospect.
237. How can Highland Council say that there is no issue with regard to transport without consulting residents of properties which will be directly affected by transport of this material.
238. Overall feasibility of proposed route
239. It has been demonstrated above [from CWAG/010 Table 2.9] that transport of similar-sized turbines to those proposed for Baillie require abnormal loads of width up to 4.3m, length up to 45m, and weight up to 130Te to travel along the route from Scrabster to the Baillie site at an average rate of 2 loads per night for 12 months.
240. For safety and road-loading purposes, abnormal loads weighing up to 130Te need to be transported in the middle of the road. The BWL Statement of Case Annex 2 contains planning conditions. Condition 20 states that their traffic plan will contain arrangements *"Allowing traffic to pass on at least 3 occasions during the transportation of abnormal loads"*.
241. The question is - where? There are few places between Scrabster and Isauld where a load in excess of 4m width can be stopped in order to allow traffic to pass safely. It would appear that during night time transport operations, the main road from Scrabster to Isauld, and also the C1 road from Isauld to Baillie site, will be closed to traffic for the majority of the time.

242. The impact of this on regular traffic has been assessed by the developers in the 2004 ES. However, West Caithness is rather unique in that the number of roads are few, and no alternatives exist for provision of emergency arrangements for Dounreay, Vulcan, and for local emergency services from Thurso to the west.
243. I believe that the transport arrangements and route suggested pose unnecessary and additional risks to human health and safety. I also believe that this has been overlooked by the relevant Authorities, and would offer the commentary below.
244. Impact on Dounreay and Vulcan emergency arrangements
245. Dounreay Site is a nuclear licensed site with three redundant nuclear reactors and some considerable radioactive hazards. Vulcan site contains a working nuclear reactor. These need to be managed in accordance with appropriate Regulations. Part of those Regulations require that appropriate emergency evacuation routes as agreed with appropriate Authorities are available at all times. I believe that agreed evacuation routes would be compromised during the transport of abnormal loads - and for a period of one year, in both directions from the exits from both sites.
246. As discussed above, the proposed transport route requires the main A9(T) Scrabster to Isauld road, and also the C1 Isauld to Baillie site road to be closed to traffic during night-time transport operations for a period of 12 months. There is no guarantee that the route will not be required for emergency evacuation of Dounreay or Vulcan within that time, and no alternative routes available.
247. I do not believe that developers have consulted with either Dounreay or Vulcan emergency co-ordination services regarding their proposed transport strategy for wind turbine components for Baillie.
248. Impact on provision of local emergency services
249. As discussed above, the proposed transport route requires the main A9(T) Scrabster to Isauld road, and also the C1 Isauld to Baillie site road to be

closed to traffic during night-time transport operations for a period of 12 months.

250. There is no guarantee that the route will not be required for provision of police, ambulance, fire brigade or mountain rescue services from the Thurso area to West Caithness and beyond within that time, and no alternative routes available.
251. I do not believe that developers have consulted with emergency services or considered this aspect when preparing their proposed transport strategy for wind turbine components for Baillie.
252. Transport summary
253. Through developer's shortfalls in failing to provide Highland Council and others with appropriate key data for transport of abnormal loads, the feasibility of the route has not been able to be properly assessed.
254. Impact upon emergency evacuation of the Dounreay and Vulcan sites has not been considered by the developers, and poses a key risk to public safety should an emergency occur during abnormal load transport.
255. Impact upon provision of emergency services from Thurso to West Caithness and beyond has not been considered by the developers, and poses a key risk to public safety should an emergency occur during abnormal load transport.
256. Developers have failed to consult with almost everyone who would be affected during transport of wind turbine components, including: residents who would be directly affected by the proposed transport route; Dounreay and Vulcan authorities and their emergency arrangement teams; and with providers of local emergency service.
257. Developers have failed to include 12,740 HGV transports between Achscrabster and Baillie site in their overall traffic impact assessment;
258. Public concerns from objection letters specifically detailing transport issues have been ignored and have not been addressed.

259. Exaggeration and misleading the public in claimed CO2 savings

260. Surprisingly, no claims for CO₂ savings were provided by the developer in the 2004 ES or the 2006 ES addendum.
261. In May 2006, Baillie Wind Farm Limited issued a propaganda leaflet "Caithness Wind Energy News" which was circulated to local people, promising community benefit and requesting them to complete a questionnaire on renewable energy [CWAG/098]. The front page of the leaflet also stated, without caveat, that Baillie wind farm would save "over 140,000 tonnes of carbon dioxide" on an annual basis, based on a 57.5MW capacity wind farm.
262. However the calculation to come up with this figure was shown to be incorrect (overstated by double) by an Advertising Standards Authority adjudication on the 21st December 2005. The company against which the adjudication was served this withdrew their literature from circulation in November 2004. This adjudication was six months before the Baillie propaganda leaflet was issued.
263. Before making environmental claims I would suggest that any responsible company would have used the (free) services of the Committee of Advertising Practice which give very clear guidance in this matter, and refers to the December 2005 adjudication.
264. BWEA has its own guidance on this matter [CWAG/052]. Using the BWEA calculation and guidance, the calculated CO₂ savings from Baillie wind farm at 57.5MW capacity are less than 65,000 Tonnes per annum.
265. Therefore the claim that Baillie wind farm would save over 140,000 tonnes of carbon dioxide annually is a vast over-exaggeration - more than twice the true figure. I suggest that this statement on the front page of the "Caithness Wind Energy News" misled members of the public who then completed the attached questionnaire, and would ask that the Reporter takes this into account in consideration of the results of the 2006 exercise by "Holyrood Consultations".
266. In 2007, the Strategic Energy Alliance (SEA) undertook a petition on behalf of Baillie Wind Farm Limited. According to the SEA website (<http://www.se-alliance.org.uk/index.shtml>) SEA are a group of activists which will undertake petitions and surveys on behalf of wind farm developers. Their website states that "SEA has always found that when

the general public are given the opportunity and provided with substantiated and factually correct information, the vast majority are fully in support of wind power".

267. SEA sanctioned support for the Baillie wind farm at various locations including Thurso, Wick and Inverness. Specific dates are not known by CWAG, but the example in CWAG/063 shows a date of 9 June 2007. The A4 sheet which the public were asked to sign [CWAG/063] states, without caveat, that the "52.5MW" development would save "140,000 tonnes of CO2 annually"
268. This statement is even more misleading than the one made by Baillie Wind Farm Limited and discussed above. It both underplays the capacity of the development and also claims vastly exaggerated CO2 savings. For a 52.5MW wind farm, calculated CO2 savings using the BWEA methodology [CWAG/052] are less than 60,000 tonnes per annum.
269. Therefore the claim that Baillie wind farm would save over 140,000 tonnes of carbon dioxide annually - either at 52.5 MW capacity or at 57.5 MW capacity - is a vast over-exaggeration. I suggest that this statement on the SEA support petition misled members of the public who trusted the printed statement and signed their names believing the statement to be true.
270. It is interesting to note that in a letter to the John O'Groats Journal on 14 December 2007, BWL Director Tom Pottinger states that Baillie "would save in the order of 70,000 tons of CO2 per annum" [CWAG/096]. This more correct mass of CO2 was obviously known by the Baillie Developers in 2007, and this indicates that they may have known the correct CO2 mass when the poll was undertaken.
271. The SEA support petition has a further misleading statement which claims that for the development to proceed "no new pylon lines are needed". The National Grid's 7 year statement is clear that Baillie wind farm cannot proceed without upgrade of the Beauy-Denny pylon line.
272. Both the above statements regarding CO2 savings and pylons make a complete mockery of SEA's claim to provide "substantiated and factually correct information".

273. As a result of the above, I request the Reporter to consider that the public were misled during the 2007 petition by SEA, and that as a result, all support claimed as a result of that petition should be rendered null and void.

274. Conclusion

275. I conclude by suggesting that given the above evidence, any positive contribution from the Baillie development is far outweighed by the negative aspects. This is not a balance to be decided – real evidence is heavily weighted against the development. Turbines are proposed far too close to residential homes. Risks and unknowns to members of the public are considerable. Relevant comments and concerns by Scottish Ministers, Statutory Consultees, and members of the public have been ignored. Developers have considerably over-stated advantages from the scheme, and have misled the public through statements made in their 2007 support petition, and in the poll carried out by "Holyrood Consultations". There is little in support of the development. I would therefore request that the Reporter endorses Highland Council's decision to recommend the refusal of s.36 consent and deemed Planning Permission for the Baillie development.

David Craig
27 February 2009

APPENDIX 1: REFERENCES FOR SETBACK DISTANCES

CRS Report for Congress: Wind Power in the United States, Technology, Economic, and Policy Issues (see p. 34)

Jeffrey Logan and Stan Mark Kaplan, Specialists in Energy Policy

1 km (3,281 feet) setback

opencrs.com/document/RL34546

Ontario (Canada) Ministry of the Environment

1,000 meters (3,280 feet)

<http://www.ene.gov.on.ca/envision/gp/5135e.pdf>

Rock County (Wisconsin)

Rock County Tax-Payers for a Better Renewable Energy Plan

2,640-foot setback

betterplan.squarespace.com/wind-ordinances-wisconsin-stat/

Union Township (Wisconsin)

2,640-foot setback

<http://www.windaction.org/news/18857>

Union Township Final Report (see pp. 99ff.)

betterplan.squarespace.com/town-of-union-final-report/

Blair County (Wisconsin)

2,500-foot setback

www.windaction.org/news/17014

wearecentralpa.com/content/fulltext/?cid=18031

Potter County (Pennsylvania)

2,900-foot setback from residential property lines

[http://concernedcitizens.homestead.com/files/windfarms/Potter Co. wind law Oct07.jpg](http://concernedcitizens.homestead.com/files/windfarms/Potter_Co._wind_law_Oct07.jpg)

[Potter Co. wind law Oct07.jpg](http://concernedcitizens.homestead.com/files/windfarms/Potter_Co._wind_law_Oct07.jpg)

Town of Allegany (New York)

2,500-foot setback from residential zone

http://www.allegany.org/images/upload/town_allegany_wind_energy_law_adopted_8-28-07.pdf

Town of Lyme (New York)

4,500-foot setback from residential villages

<http://www.acousticecology.org/newsarchive/newsarchiveurban.html>

George W. Kamperman, INCE Bd. Cert. Emeritus Kamperman Associates, Inc.

george@kamperman.com

Richard R. James, INCE E-Coustic Solutions rickjames@e-coustic.com

Simple guidelines for siting wind turbines to prevent health risks

1 km (3,280 feet) or more setback

www.windaction.org/?module=uploads&func=download&fileId=1650

French Academy of Medicine

1.5 km (.9-mile) setback

kirbymtn.blogspot.com/2006/03/french-academy-of-medicine-warns-of.html

Trempealeau County (Wisconsin)

1-mile setback

betterplan.squarespace.com/the-trempealeau-county-wind-ord/

Washoe County Planning Commission, NV

1-mile setback

<http://www.windaction.org/news/20097>

National Wind Watch

1-mile setback

www.wind-watch.org/press-070402.php

U.K. Noise Association (UKNA)

1-mile setback

U.K. Noise Association: 1 mile setback needed for wind turbines

kirbymtn.blogspot.com/2006/08/uk-noise-association-1-mile-setback.html

Beech Ridge Wind Farm (West Virginia)

1 to 4 miles setback

www.beechridgewind.com/Docs/1-25-06_Beech_Ridge_Wind_Fa_Sheet.pdf

Fayette County (Pennsylvania)

Deal reached in wind turbine dispute

6,000-foot (1.1 mile) setback

www.windaction.org/news/16447

www.pittsburghlive.com/x/pittsburghtrib/news/fayette/s_573705.html

Noise Radiation from Wind Turbines Installed New Homes: Effects on Health

2 km (1.2 mile) setback

www.windturbinenoisehealthhumanrights.com/wtnhhr_june2007.pdf

Location, Location, Location: An investigation into wind farms and noise by the UK Noise Association (UKNA)

1 to 1.5 mile setback

www.windaction.org/documents/4281

summary

http://www.ukna.org.uk/index_files/page0015.htm

Are wind farm turbines making people sick? Some say yes.

1.5 mile setback

www.pantagraph.com/articles/2008/04/17/news/doc4807500d59725857996033.txt

Dr. Nina Pierport

1.5 mile setback, more for mountainous geography
Health Effects of Wind Turbine Noise
www.windturbinesyndrome.com/?p=76

Dr. Amanda Harry
1.5 mile setback
www.windturbinehealthhumanrights.com/wtnoise_health_2007_a_barry.pdf

Riverside County (California)
2-mile setback
www.rcip.org/documents/general_plan/gen_plan/03_d_16.pdf

Welsh Select Affairs Committee (Wales)
Marjolaine Villey-Migraine
Docteur en sciences de l'information et de la communication, Université Paris II-Panthéon-Assas, Spécialiste de l'Information Scientifique et Technique (IST)
5 km (3.1 miles)
www.wind-watch.org/documents/?p=588

Recommendations on the Siting of Windfarms in the Vicinity of Eskdalemuir, Scotland (2005) (10.87 MB)
10 km (6.2-mile) setback
www.esci.keele.ac.uk/geophysics/dunlaw/Final_Report.pdf