

**In the Environment Court
I Mua I Te Kōti Taiao O Aotearoa**

Under the Resource Management Act 1991 (**RMA**)

and in the matter of the direct referral of an application for resource consents by
Meridian Energy Limited in respect of the proposed Mt Munro wind farm under section
87G of the Resource Management Act 1991

Meridian Energy Limited
Applicant

and

**Tararua District Council, Masterton District Council, Manawatū-
Whanganui Regional Council and Greater Wellington Regional Council
(Councils)**
Consent Authorities

and

s 274 Parties

**Statement of Evidence of Glen Andrew Wright on behalf of Meridian
Energy Limited**

24 May 2024

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INTRODUCTION

1. My full name is Glen Andrew Wright.
2. I am employed as a Principal at Stephenson & Turner, an architectural and engineering consultancy based in Wellington. I have a New Zealand Certificate of Engineering (Electrical), and I am a Registered Engineering Associate, an Associate Member of the Illuminating Engineering Society of Australia and New Zealand and a Member of Engineering New Zealand.
3. I have over 30 years' experience in lighting design, application and review. This includes aviation warning lights, exterior lighting for amenity, security and appearance, and also includes public spaces, carparks, walkways, sports fields and buildings in urban and rural environments. I am a recipient of six national lighting awards.
4. I have provided lighting effects advice to Auckland, Whangarei, Wellington, Porirua, Upper Hutt and Napier City/District Councils, and I was South Wairarapa District Council's lighting technical adviser for the recent Dark Sky Plan Change 12 to the Wairarapa Combined District Plan, which is associated with the establishment of the Dark Sky Management Area. I am a past recipient of six national lighting awards.
5. In 2023 I was engaged by Meridian Energy Limited (**Meridian**) to assess the effects of lighting at the proposed Mt Munro windfarm in the Northern Wairarapa (**Mt Munro** or the **Project**), including preparing a lighting concept design. I completed this assessment in September 2023, and confirm that I hold the same views and conclusions as expressed in the technical report. This report was included as Appendix 7 of Meridian's Section 92 Response dated 7 September 2023 (referred to in this evidence as the **Lighting Report** or **my report**).
6. As part of this work, I conducted a site visit in August 2023, which included daytime and nighttime observations.

CODE OF CONDUCT

7. I confirm that I have read the 'Code of Conduct for Expert Witnesses' contained in the Environment Court Consolidated Practice Note 2023. I agree to comply with this Code of Conduct. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

8. I have been asked to provide evidence on the lighting effects associated with different aspects of the Project.
9. In this evidence, I also:
- (a) Respond to issues raised in submissions;
 - (b) Respond to the s87F report; and
 - (c) Comment on conditions.
10. In preparing this evidence I have reviewed the draft statements of evidence of other experts relevant to my area of expertise including the evidence of:
- (a) Mr Rhys Girvan – Landscape and Visual Effects.
11. I have also reviewed the report prepared by Mr John McKensey on behalf of the Councils on - Lighting effects, attached as Appendix 11 to the section 87F Report.

LIGHT SOURCES

12. My report included an assessment of the following proposed light sources:
- (a) Construction lighting, which includes vehicle headlight sweep, security building lights, main laydown area lights, concrete batching plant lights and turbine laydown area lights; and

- (b) Operational lighting, which includes vehicle headlight sweep, operations and maintenance building lights, site substation lights, terminal substation lights, aviation warning lights.
- 13. I note that intersection and road lighting were not assessed, as these are not proposed for Mt Munro.

METHODOLOGY

- 14. My assessment of the effects of the proposed lighting for the Mt Munro Wind Farm is in relation to the limits recommended in AS/NZS 4282:2019, and in relation to the Tararua District Plan and Wairarapa Combined District Plan permitted activity lighting standards. Effects on dwellings within 2 km of the site were considered, consistent with the landscape and visual effects assessment undertaken by Boffa Miskell Limited, which is attached as Appendix K to the AEE.
- 15. Several possible obtrusive effects of the proposed windfarm lighting required consideration. These were:
 - (a) Spill light;
 - (b) Glare;
 - (c) Skyglow;
 - (d) Effects on road users;
 - (e) Headlight sweep; and
 - (f) Flashing of aviation warning lights.

SUMMARY OF LIGHTING EFFECTS REPORT AND RECOMMENDATIONS

- 16. In summary, the findings expressed in my report are that:
 - (a) All the proposed lighting will meet the Tararua and Wairarapa Combined District Plans permitted activity spill light standard of 8 lux at the site boundary.¹

¹ Tararua District Plan Standard 5.4.7.2(b), Wairarapa Combined District Plan Rule 21.1.11

- (b) All the proposed lighting will meet the recommendations of AS/NZS 4282:2019.
- (c) Flashing aviation warning lights already exist within the wider environment, with long distance views of the Turitea Wind Farm aviation warning lights available from some locations in proximity to the site. The proposed aviation warning lights provide positive aviation safety effects, and their obtrusive effects are no more than minor. Their flashing will not result in any medical issues (i.e. epileptic seizures) as the flashing rate is too low. The level of skyglow effect will be no more than minor.
- (d) Aside from the aviation warning lights, the proposal does not include any lighting that is on throughout every night. Building mounted security lights are only on at night when there is occupancy. Yard lighting is only on when required and its expected usage is very low. This lighting will not project any light above the horizontal and will not spill light to dwellings. Obtrusive effects will therefore be less than minor.
- (e) Temporary portable construction lighting usage is low, and is only required for continuous concrete pours and some turbine lifts. Only the turbine lift lighting will project light above the horizontal, and this is not expected to occur for more than 30 nights over the construction period.
- (f) Nighttime vehicle movements associated with the Wind Farm will not result in headlight sweep effects to dwellings on Old Coach Road.

RESPONSE TO ISSUES IN SUBMISSIONS

17. I have reviewed the relevant submissions on the Applications, and note that submissions 8 (Clarke), 11 (Maxwell), 13 (Hastwell. Mt Munro Protection Society Inc), 17 (Wallace), 21 (Semmens), 34 (Glen Opel Ltd), 35 (Duffell), 37 (Olliver), 41 (Tomlin), 45 (Hamilton), 47, 48 & 49 (Braddick), 56 (McIlraith), 57 (Tait), 61 (Bardella), and 71 (Sutherland) make reference to lighting issues.

18. I address the matters relevant to lighting in these submissions below.
19. Only one submission (57: Tait) raised an issue with light effects from both construction and operation of the wind farm. The other submissions listed above raised lighting issues with the aviation warning lights only.
20. Mrs Tait has raised concerns about the potential physical impacts of the proposed Mt Munro windfarm on patients she sees at the Eketahuna Health Centre, including impacts caused by light.
21. I am not a medical professional, but from my experience in assessments of lighting effects complaints, both steady and flashing lights affect people when they project obtrusive levels of spill light at dwelling windows or there are views of bright light sources. It is my opinion that the proposed lightings spill light levels at dwelling windows and light source brightness viewed from dwellings will be below levels I would expect to produce any nuisance or health effects on occupants.
22. In my assessments of lighting effects I used the AS/NZS 4282:2019 more restrictive “curfew” limits, the introduction to this standard states “The more restrictive values, applying during the curfew period, are predicated on the maintenance of amenity and environmental integrity being the dominant considerations. The spill light at these times should be such that it will not be obtrusive to the large majority of recipients.”
23. There were several submitters who expressed concerns about “flicker”. For most submitters this was “shadow flicker” which occurs when the sun is low in the sky and wind turbine blades periodically cast shadows over a neighbouring property as they turn. Shadow flicker is not within my area of expertise, and is instead addressed in the evidence of Mr Faulkner and Mr Girvan.
24. However, I note that several submitters referred to ‘flicker’ as being associated with the aviation lights, which I do address here.² The definition of “flicker” when in relation to a light is when you have a light that is producing rapid variations in brightness. I considered the

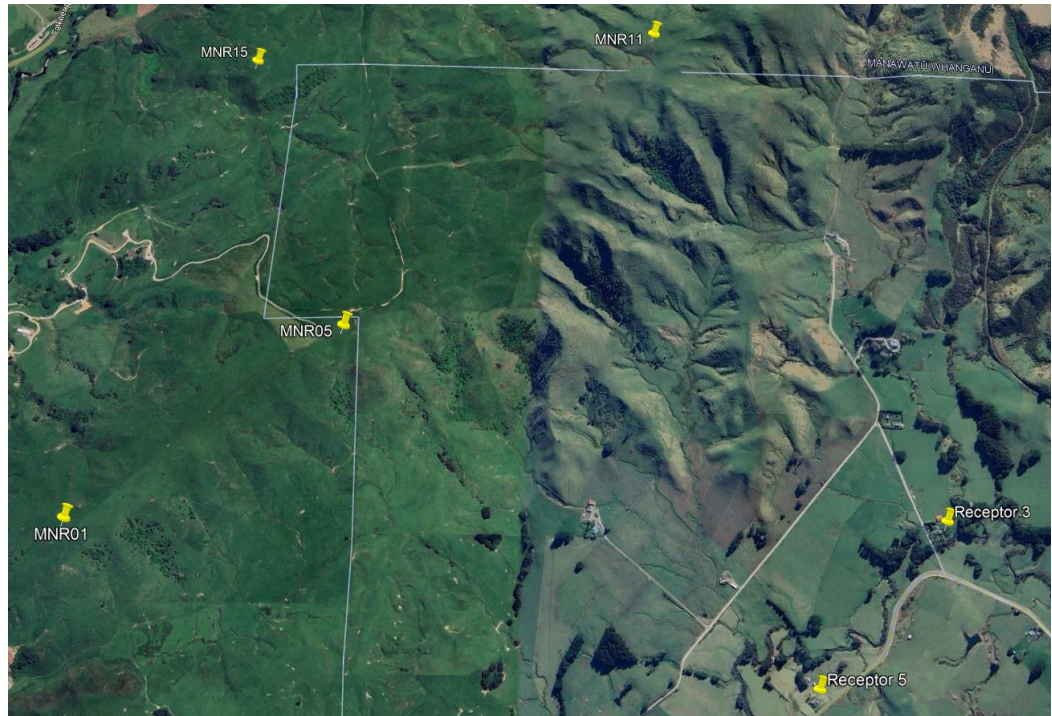
² 41 (Tomlin), 48 (Braddick), 71 (Sutherland)

flashing or 'flicker' of aviation warning lights in my report, and at section 8.7 I stated that *"No health effects can be attributed to the flashing of the medium intensity aviation warning lights as the flashing rate is low."*

25. I acknowledge that flashing light can be disturbing if it produces appreciable levels of spill light or has an appreciable light source brightness. However, the proposed aviation warning lights for Mt Munro will not produce discernible levels of spill light and will not have an appreciable light source brightness. This is why my assessment is that the effects of aviation warning lights will be less than minor, and there will be no adverse health effects from aviation lighting.
26. Submission 8 (Mr Clarke) raised the issue of light pollution. From my reading of Mr Clarke's submission it appears to me that it is light pollution from the aviation warning lights that he is referring to when he states *"the Application fails to provide adequate information on the impact of light pollution on residents;"*
27. The proposed aviation warning lights will not produce discernible levels of spill light and will not have an appreciable light source brightness and therefore I do not consider them to be contributing to spill light or glare light pollution. Whether or not the views of these lights amount to visual pollution is outside my area of expertise.
28. Submission 13 (Hastwell/Mt Munro Protection Society Incorporated) and 8 (Clarke) suggest that "That turbines are set at heights (i.e., below the ridgeline) that negates the need for aviation lights."
29. Setting towers at lower heights below the ridgeline does not negate the Civil Aviation Authority requirement to provide aviation warning lights. It is the height of the turbine which determines this, and turbines over 60 m high are required to have lights. When there are multiple turbines warning lights are only required on selected turbines.
30. Several submitters expressed concerns that the aviation warning lights will negatively affect the enjoyment of night views of the sky.³

³ 8 (Clarke), 11 (Maxwell), 13 (Haswell), 17 (Wallace), 34 (Glen Opel Ltd), 35 (Duffell), 37 (Oliver), 47, 48 & 49 (Braddick)

31. On a clear night the aviation warning lights will not contribute any discernible light into the sky and therefore will not diminish the brightness of the night sky and therefore will not diminish sky views. Effects on views will be limited to the addition of red aviation lights themselves.
32. Submission 13 (Hastwell/Mt Munro Protection Society Incorporated) raised the issue of loss of darkness at night so close to residents creating sleep deprivation effects.
33. My reading of this submission is that the submission is referring to the loss of darkness at night associated with the light from the aviation warning lights. There will be no discernible spill light from the aviation warning lights at dwellings and therefore no loss of darkness in dwelling rooms and therefore no impact on sleep.
34. Submissions 13 (Hastwell/Mt Munro Protection Society Incorporated) and 21 (Semmens) raise concerns about the effect the aviation warning lights might have on birds, insects and other species.
35. I am not an expert in ecology, and I refer to the evidence of Dr Bull on this point in relation to effects on birds.
36. Submission 34 (Glen Opel Ltd) requested Meridian assess and report on the light pollution issues for tenants of the two properties owned by the submitter, and to discuss mitigation with Glen Opel Ltd.
37. With reference to the Boffa Miskell Landscape Effects Assessment (attached as Appendix K to the Assessment of Effects on the Environment (**AEE**)), I understand that the two tenanted dwellings are Receptor 3 (12 Smiths Line) and Receptor 5 (2310 Opaki Kaiparoro Road). Their locations are identified on the below aerial image.



38. Receptor 3 is a dwelling located approximately 1.7 km from nearest potential turbine site (MNR 05).
39. Receptor 5 is a dwelling located approximately 1.8 km from nearest potential turbine site (MNR 05).
40. From my assessments of lighting effects it is my opinion that light pollution effects for these dwellings will be negligible and therefore no additional mitigation is required.

SECTION 87F REPORT

41. I have read the section 87F Report prepared for this matter, and the report prepared by Mr John McKensey, the Councils' lighting expert, which is attached as Appendix 11 to that report.
42. I note the reporting officer relies on Mr McKensey's advice and the conditions he proposes. On that basis, they consider the lighting effects of the proposal to be acceptable.⁴ I agree with the reporting officer's conclusion.

⁴ Page 185 – paragraph 640 of the s 87F report

43. In this section I focus on the issues raised by Mr McKensy which have not already been canvassed earlier in my evidence.
44. Mr McKensy has noted that he considers that my Report (which he refers to as the S&T Report) adequately addresses the matters raised in RFI#1. Specifically, he is happy that my Report confirms the extent of proposed lighting and includes a lighting concept design with calculated lighting effects, analysis of compliance with relevant statutory provisions and an analysis of lighting effects.⁵
45. Mr McKensy has considered the Proposed Wairarapa Combined District Plan (**PWCDP**) which had not been notified at the time I prepared my Report. I agree with his assessment of its requirements which includes PWCDP Standard LIGHT-S1 requiring all outdoor lighting to have a colour temperature no greater than 3000K.
46. In my report I state that all light sources will have a colour temperature of 3000K, except for the concrete batching plant which has a colour temperature of 4000K⁶. Mr McKensy is of the opinion that the concrete batching plant has an operational need for 4000K and if LIGHT-S1 was to come into effect as presently drafted he would support the use of 4000K for the concrete batching plant.⁷ I agree with this conclusion.
47. Mr McKensy has identified some roads for which I did not assess the potential effects of headlight sweep. I concur with his assessment that the effects for headlight sweep in these circumstances to be nil, very low, or less than minor.⁸
48. I agree with Mr McKensy's proposed conditions⁹, and note that they align with the lighting design parameters I have for the lighting proposed in my report.

⁵ Page 9 – paragraph 25

⁶ S&T Report – page 31, 1st paragraph

⁷ Page 14 – paragraphs 36 & 37

⁸ Pages 14 & 15

⁹ Pages 21, 22 & 23

49. I note Mr McKensey considers the draft conditions with regard to the proposed Lighting Management Plan (**LMP**) to be satisfactory.
50. I agree with Mr McKensey's key conclusions in his Executive Summary.¹⁰

CONDITIONS

51. I note that Meridian has proposed a condition of consent requiring a Construction Light Management Plan (CLMP).¹¹ This plan would detail where all lights associated with construction of the windfarm are to be located, and when they are likely to be used, and would have to be submitted to and approved by the Masterton and Tararua District Councils prior to construction of the windfarm. The CLMP would be required to set out the measures being taken to ensure that lights are focussed on work areas, and not in the direction of light sensitive receivers (such as dwellings and public roads).
52. I recommend that this condition and the conditions recommended by Mr McKensey are appropriate, and nothing I have read in submissions causes me to alter my assessment.
53. These recommended conditions are now conditions CL1 to CL3 in Meridian's updated proffered condition set, which is attached to the evidence of Mr Anderson.

CONCLUSIONS

54. The lighting proposed in my lighting report will comply with Tararua and Wairarapa Combined District Plan lighting standards.
55. The lighting effects will comply with the recommendations in AS/NZS 4282:2023.
56. The lighting effects will be less than minor, and no more than minor in relation to the aviation warning lights.

¹⁰ Pages 6 & 7 – paragraphs 16 & 17

¹¹ Response to Section 92 Request dated September 2023, at page 9

57. The lighting effects associated with the proposed Mt Munro wind farm are therefore acceptable, and can be managed satisfactorily through conditions.

Glen Wright

24 May 2024