



Monday, 13 April 2026

Renewables Regulatory Practice Section
Environment Regulation Division
Department of Climate Change, Energy, the Environment and Water
John Gorton Building, King Edward Terrace
Parkes ACT 2600, Australia.

Dear Renewables Regulatory Practice Section

Re: CEC submission regarding consultation on draft catalogue of measures to avoid and mitigate collisions of birds and bats with wind farms

The Clean Energy Council (**CEC**) welcomes the opportunity to provide a submission to the Department of Climate Change, Energy, the Environment and Water (**DCCEEW**) on the *draft catalogue of measures to avoid and mitigate collisions of birds and bats with wind farms* (**Catalogue of Measures**). We also refer to the *Review of the effectiveness of onshore and offshore wind farm collision risk avoidance and mitigation measures* prepared by the Arthur Rylah Institute for Environmental Research (**Literature Review**).

The CEC is the peak body for the clean energy industry in Australia. The CEC supports the intent of the Catalogue of Measures to assist developers with planning wind farms and implementing avoidance and mitigation strategies to reduce environmental impacts and improve assessment processes under the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**).

The CEC's comments focus on ensuring there is clarity regarding how the Catalogue of Measures will be integrated into the EPBC Act approval process, to avoid a scenario where proponents are expected to adopt all available mitigation measures rather than applying them proportionately based on project-specific risks. The introduction of a risk-based decision matrix, and the development of model conditions would support consistent and transparent approvals. In addition to the interaction with the EPBC approval process, the Catalogue of Measures should clarify the interaction with the Australian Collision Risk Framework (**ACRF**).

More broadly, the Catalogue of Measures would benefit from clearer direction on the appropriate use and commercial implications of curtailment; greater recognition of data limitations and cumulative impacts; improved alignment with regulatory, safety, and planning constraints; and greater incorporation of emerging technologies.

1. Biodiversity context

1. The Catalogue of Measures should be grounded in the broader biodiversity context. Many species of concern have experienced significant population declines in recent years due to multiple, well-established pressures, with collision risk from wind energy infrastructure generally representing a comparatively minor contributor. Key drivers of decline include habitat loss and fragmentation,

predation by invasive species, bushfires, and heat stress associated with increasingly severe weather events linked to climate change.¹

2. Accordingly, the Catalogue of Measures should ensure that mitigation expectations are proportionate to the relative contribution of collision risk, rather than treating it in isolation or as a primary threat in all cases. An overemphasis on lower impact risks may divert resources from more effective conservation actions.
3. It is also important to recognise the broader environmental benefits of renewable energy projects, including their critical role in reducing greenhouse gas emissions and mitigating climate change, which is one of the most significant threats to biodiversity. A balanced approach within the Catalogue of Measures will better support both species protection and the transition to a low-carbon energy system.

2. Integration with approval process and proportionality

4. There remains a lack of clarity regarding how the draft Catalogue of Measures will be integrated into the EPBC Act approval process. In particular, there is concern that the Catalogue of Measures may implicitly require proponents to adopt all available measures, rather than applying them proportionately and having regard to the context and risk rating of a specific project. Greater guidance is needed on how the Catalogue of Measures will inform regulatory expectations and the development of approval conditions, including clarification of the interaction with the Australian Collision Risk Framework (**ACRF**). To assist with integration and proportionality, the CEC makes three recommendations:

a. Model conditions

Integration of the Catalogue of Measures into the EPBC Act approval process would be supported by model conditions. This would improve consistency and clarity for both decision-makers and project proponents and help ensure that appropriate measures are applied in practice. As the body of evidence in relation to collision mitigation evolves, the draft conditions should be updated as a mechanism to reflect this evolving evidence. Draft approval conditions would also provide certainty to proponents regarding the requirements for each of the mitigation options, for example, the conditions could include details regarding the monitoring and reporting requirements for the specific options.

¹ The 2021 State of the Environment Report states '[t]he 2 pressures that have caused the most extinction of Australian terrestrial species since the beginning of colonisation are introduced species (causing the loss of 64 species), and habitat loss and clearing (62 species). In an analysis of all nationally listed threatened terrestrial and aquatic plants and animals in Australia as of July 2018, the same 2 threats were most frequently listed: habitat loss, fragmentation and degradation (1,210 taxa); and invasive species and disease (966 taxa) (Ward et al. 2021). In more recent times, known extinctions have been associated with introduced disease, sea level rise, and introduced reptiles and fish (Woinarski et al. 2019).¹ In addition, this report notes the following regarding climate change: 'Changes in climate that have been recorded across the Australian landmass are associated with a range of biodiversity responses, including decreases in some species and increases in others. Alpine ecosystems and biodiversity in Australia are particularly vulnerable to climate change that affects snow depth, and the spatial and temporal extent of snow, which have all declined since the late 1950s'.

Any model conditions should be developed in consultation with industry and should be prepared in a consultative and iterative manner. They should be applied as guidance rather than prescriptive requirements, with proponents able to propose alternative, fit-for-purpose conditions where appropriate.

b. Risk-based decision framework

To improve proportionality with the application of the draft Catalogue of Measures, the CEC recommends including a risk-based framework to guide the selection of mitigation measures. The Catalogue of Measures should include a structured decision-making approach that considers the proportionality between the level of environmental risk and the commercial and operational burden associated with implementing specific measures. Without such a framework, there is a risk that higher-cost or more intensive mitigation options may be applied in circumstances where they are not commensurate with the scale or likelihood of impact.

Similarly, there is a risk that the Catalogue of Measures could be applied as a de facto checklist, requiring proponents to justify the inclusion or exclusion of each measure. Instead, it should be clearly positioned as guidance to support the selection of mitigation measures that are proportionate and appropriate to the specific project context. Inclusion of a risk matrix will also assist the relevant decision maker in applying a consistent approach between projects.

We also suggest further consideration at a technology-specific level to confirm whether the listed measures are appropriately applicable. For example, while the Catalogue of Measures identifies both insectivorous and fruit bats as potentially relevant to offshore wind, the significant distance of turbines from shore (generally greater than 10 kilometres) means the likelihood of bat presence is very low. Their inclusion in the assessment may nonetheless trigger consideration of unacceptable impacts and associated mitigation, even where the risk is negligible, which may not reflect a proportionate, risk-based approach.

c. Recognition of the role of offsets

In some circumstances, requiring proponents to invest very large sums in collision mitigation measures to address a relatively small residual risk to a limited number of birds or bats may not represent the most effective outcome for biodiversity. There may be cases where equivalent or greater biodiversity benefits could be achieved through alternative ecological investments, such as targeted habitat restoration or conservation programs.

The Catalogue of Measures should explicitly recognise the role of biodiversity offsets under the EPBC Act and clarify how offsetting may interact with mitigation measures, consistent with the mitigation hierarchy. This would support proportionate decision-making and ensure that conservation resources are directed to where they deliver the greatest overall environmental benefit.

Recommendation 1: Clarify how the Catalogue of Measures will be applied within the EPBC Act approval process.

Recommendation 2: Provide guidance on when specific mitigation options are appropriate, linked to the ACRF.

Recommendation 3: Develop a decision matrix to ensure proportionality. Higher-risk species and more serious impacts warrant stronger, higher-cost mitigation, while lower-risk scenarios justify less intensive measures.

Recommendation 4: Establish a library of model conditions for each mitigation option, including standardised monitoring and reporting requirements.

Recommendation 5: Expressly recognise the role and applicability of offsets where appropriate under the mitigation hierarchy.

3. Curtailment

5. The current emphasis on curtailment in the Catalogue of Measures warrants further refinement. The Catalogue of Measures makes the following conclusions in relation to curtailment:
 - a. In relation to onshore wind farms, feathering, low wind speed curtailment and informed curtailment have been shown to be effective for reducing impacts on insectivorous bats.
 - b. In relation to onshore wind farms, manual curtailment and automated shutdowns have demonstrated effectiveness for land birds.
 - c. In relation to offshore wind farms, feathering and various types of curtailment have demonstrated effectiveness for insectivorous bats.²
6. This evidence should not be interpreted as establishing curtailment as the only or most effective mitigation pathway. As noted above, there is a risk that regulators may require 'all available measures' without an appropriate cost-benefit or proportionality assessment.
7. A focus on 'all available measures is a particular concern in relation to curtailment – given the commercial and financial risks for projects with curtailment conditions. A key consideration for industry is that automatic curtailment can trigger Frequency Control Ancillary Services (**FCAS**) penalties, as it may reduce a wind farm's ability to deliver the volume of energy bid into the market within a five-minute dispatch interval. This is a significant issue and accordingly, industry generally recommends that automatic curtailment only be considered in the most high-risk scenarios (using the matrix addressed in Recommendation 3 above). In addition, and as a result of the FCAS risks, projects may have bankability issues if approvals contain conditions requiring curtailment to address bird and bat risks.
8. To assist with balancing the commercial implications of curtailment the CEC makes the following recommendations:
 - a. **Include commercial and feasibility considerations in the analysis of each mitigation option**

The assessment of each mitigation measure should more explicitly incorporate commercial and feasibility considerations. This could include analysis of the impacts on energy generation,

² Catalogue of Measures, page 9-10.

project revenue and constraints due to wind resources or the National Electricity Rules. Such analysis will support proportionate decision-making.

For example, the case study on feathering and curtailment at Fowler Ridge Wind Farm did not include information on energy losses or operational costs, which makes it difficult to undertake a proportionality assessment.³ By contrast, the informed curtailment case study, which used seasonal patterns in bat activity to refine operations, demonstrated that curtailment could be reduced by 31%, with estimated annual revenue impacts ranging from 0.09% to 3.2%.⁴ However, this information was not incorporated into the advantages/disadvantages assessment, nor a sense of how significant these energy impacts are compared to other mitigation options.

Including commercial and feasibility information consistently across the Catalogue of Measures would enable a more balanced assessment of ecological benefits relative to economic costs. We do also note that that the curtailment examples were largely related to onshore wind, and it should be clearly stated that, unless clearly verified by industry, these examples do not translate for offshore wind. Otherwise, these examples may be misunderstood as applying across all wind technologies.

b. Reflect uncertainty in the summary table

Specific challenges with a particular mitigation option or challenges with applying the evidence in the Australian context are not captured in the summary table. For example, manual curtailment faces significant challenges relating to substantial energy loss for extended periods and may only be practical for diurnal birds and impractical in Australia due to dispersed migration patterns.⁵ The Catalogue of Measures suggests that this option may be more feasible for discrete events 'such as stubble burning which can attract raptors'. We recommend that these constraints be reflected in the summary, so it is clear that the Catalogue of Measures is not suggesting that manual curtailment should be used as a first line measure and instead should only be considered having regard to site specific factors.

c. Industry input into commentary regarding curtailment impacts

The Catalogue of Measures includes several statements on the significance of curtailment impacts. For example, curtailment of 0.2% to 1.2% of annual operating hours is described as resulting in 'negligible' energy production losses,⁶ while a 1% reduction in annual generation is considered 'within acceptable limits'.⁷ Similarly, seasonal nighttime low wind speed curtailment is associated with an annual loss of 0.16% in generation and a 0.09% reduction in revenue, characterised as modest.⁸ The CEC recommends that these assessments be informed by

³ Catalogue of Measures, page 19.

⁴ Catalogue of Measures, page 22-23.

⁵ Catalogue of Measures, page 24-25.

⁶ Catalogue of Measures, page 25.

⁷ Catalogue of Measures, page 27.

⁸ Catalogue of Measures, page 21.

industry input, noting that Australian projects may face different commercial constraints and profitability thresholds when evaluating such impacts.

Recommendation 6: In the decision matrix referenced in Recommendation 3, include detailed consideration of the various curtailment options. Include further guidance in the curtailment options regarding the degree of commercial impact as a consideration in the pros and cons assessment.

Recommendation 7: Given the significant financial impacts of automatic curtailment, include express clarification that this option should be used only in high-risk scenarios.

Recommendation 8: Include industry input into any statements regarding generation and energy impacts from curtailment.

4. Incorporating emerging technologies

9. The Catalogue of Measures primarily focuses on high-level categories of mitigation options and does not sufficiently address the role of specific, emerging technologies that may contribute to reducing bird and bat collision risks. Greater consideration of available and developing technologies could strengthen the practical utility of the Catalogue of Measures and support innovation in mitigation approaches. For example, there may be opportunities to integrate or build on work already undertaken through initiatives such as the *Renewable Energy Wildlife Institute's 2025 REWI Technology Catalog Portfolio*.
10. Where appropriate, the Catalogue of Measures should refer to these emerging technologies to assist proponents and decision-makers to better understand the range of tools available and support the adoption of evidence-based, technically feasible mitigation measures.

Recommendation 9: consider integrating (or building on) the work undertaken in the United States in the *Renewable Energy Wildlife Institute's 2025 REWI Technology Catalog Portfolio*.

5. Data constraints

11. The reliance on international data is a recognised limitation, driven largely by existing gaps in Australian-specific research. For example, in the Literature Review, the site selection review concludes that '[p]ublished studies (in English), are dominated by research from the northern hemisphere... which limits direct evidence for Australia'.⁹ The summary should clearly identify where evidence is derived from Australian studies to provide appropriate context for decision-makers.
12. We recommend reviewing certain statistics and examples considered throughout the document, ensuring that interpretations are correct and not being misrepresented. For example, a study by May et al., (2020) was referenced on page 32 of the Catalogue of Measures to state that painting

⁹ Literature Review, page 39.

of blades black reduced white-tailed eagle deaths by 100%, however this statistic could not be found in review of the paper. Similarly, the subject study provided no supporting evidence that the painted blade was the action that mitigated bird strikes. Further detail on the scale and scope of these studies is needed to ensure a fulsome interpretation of the findings can occur.

13. In addition, there are complexities in the underlying case studies which are not captured in the summary. For example, the case study regarding turbine height, found that while increasing the minimum rotor swept height provided some mortality benefits for certain bat species, increasing the height potentially increased mortality for other species.¹⁰ Data gaps and uncertainties of this nature should be clearly identified to ensure mitigation options are not adopted without further research to determine their effectiveness and potential trade-offs.

Recommendation 10: include a section in each case study regarding data gaps and areas requiring further research.

6. Measures applied during planning and site selection

14. The CEC recommends that the Catalogue of Measures emphasise the mitigation hierarchy and the principle of proportionality during the planning phase. The CEC recommends that the Catalogue of Measures include an acknowledgement that it may not be feasible to fully avoid impacts for many renewable energy projects. This approach would better reflect practical constraints and support more effective, risk-based decision-making and avoid unnecessarily precluding development in certain areas.
15. The Catalogue of Measures notes 'proponents should undertake site specific modelling of various mitigation measures early in the planning stages as part of the cost-benefit analyses to support ecologically sustainable development'.¹¹ The CEC recommends that this sentence be deleted, as it is not feasible for proponents to model mitigation measures that have not been trialed, or for which there is insufficient data. We also note that under the ACRF, mitigation measures are considered later in the process, once risks have been identified and collision modelling has been undertaken.

Recommendation 11: delete reference to proponents undertaking 'site specific modelling of various mitigation measures early in the planning stages'. Instead include reference to the process under the ACRF.

7. Cumulative impacts

16. The Catalogue of Measures does not adequately address cumulative impacts or the need for coordinated, landscape-scale collision mitigation strategies. This is a significant gap, particularly in

¹⁰ Catalogue of Measures, page 17.

¹¹ Catalogue of Measures, page 7.

regions with multiple existing or proposed wind farms, where combined impacts on bird and bat populations may be greater than those of individual projects.

17. The CEC recommends that the Catalogue of Measures include guidance on assessing and managing cumulative impacts, including how mitigation measures may be prioritised or adjusted in the context of neighbouring developments. It should also identify opportunities for collaboration between proponents, such as shared monitoring programs or pooled investment in mitigation measures, to improve efficiency and deliver stronger biodiversity outcomes at a regional scale.
18. The CEC acknowledges that management of cumulative impacts may also be addressed separately through government-led regional and strategic planning frameworks, rather than through project-by-project escalation of collision mitigation requirements

Recommendation 12: include guidance on assessing and managing cumulative impacts of bird and bat collisions.

8. Consistency with safety, landscape and noise assessment

19. The CEC recommends that the Catalogue of Measures more clearly account for safety, regulatory requirements, and planning conditions that may influence the implementation of certain mitigation options. For example, measures such as painting rotor blades black may require variation to approval conditions where turbines are required to remain white for landscape and visual impact purposes.¹² Similarly, while the section on modifying aviation lighting acknowledges potential regulatory considerations, these are not consistently reflected, including in summary tables where such measures may be presented as broadly applicable.¹³
20. Recognising that regulatory pathways can often be navigated where mitigation is feasible and proportionate, the CEC considers that more explicit acknowledgement of these factors would support a transparent and practical understanding of implementation pathways, and ensure mitigation options are presented in a realistic and workable manner.

Recommendation 13: the mitigation options should better incorporate safety and conditions restraints, particularly in relation to aviation lighting, noise and amenity constraints.

¹² Catalogue of Measures, page 33.

¹³ Catalogue of Measures, page 37.



The CEC welcomes further engagement with DCCEEW in relation to the Catalogue of Measures. If you have any queries or would like to discuss this submission in more detail please contact me on erutherford@cleanenergycouncil.org.au.

Kind regards,

A handwritten signature in black ink, appearing to read 'ERutherford', is positioned below the text 'Kind regards,'.

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