Dealing with Uncertainty: Assessing Impacts on Bird Species Arising from Onshore Wind Farm Consent Applications

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Uncertainty in the Evaluation of Wind Farm Applications on Bird Populations

• Knowledge gaps:
  – Knowledge that we know we don’t have;
  – Ambiguity in knowledge that we do have;
  – Knowledge that we don’t know that we don’t know;

• Future uncertainty – outcomes can only be estimated, with decreasing confidence over longer timescales;

• Social uncertainty – no agreement of what information is either relevant or required or ‘of significance’; and

• Legal uncertainty – what constitutes legal certainty especially with reference to ‘reasonable scientific doubt’.
1. Avoid

2. Plan and Refine

3. Mitigate

4. Compensate

Precautionary approach
WIND ENERGY DEVELOPMENTS AND EU NATURE LEGISLATION

An assessment of significant effects must be based on good science, be precautionary and it must take into account the opinion of stakeholders. This is particularly challenging when faced with the level of uncertainty resulting from the often-imprecise understanding of ecological systems. The application of proportionality in the assessment must be compatible with the precautionary principle and should take into account the nature, size and complexity of the plan or project, the expected effects as well as the vulnerability and irreplaceability of the affected EU protected habitats and species. A proportionate approach ensures that the significant effects on all the concerned EU protected habitats and species are assessed and they are effectively avoided or reduced, whilst not entailing excessive cost

Draft Guidance Document from EU 2019
(Step 1) SNH-RSPB Sensitivity Mapping
(Step 2) Protected Areas

- There is an extensive network of protected areas across Scotland. In practice, there has been a general presumption among developers and regulatory authorities that these will, for the most part be avoided. These include:
  - Special Protection Areas (EU Birds Directive)
  - Ramsar sites
  - Sites of Special Scientific Interest
  - Nature Reserves
  - Nature Conservation MPAs (at sea)
(Step 1 & 2) Initial Scoping & Assessment

- Developers can use various sources of information on species presence. These include:
  - The National Biodiversity Network
  - Local Biological Records Centres
  - Published Atlas data (some within NBN)
  - Data from Scottish Raptor Study Groups
  - Local Bird Groups/NGOs/SNH

- Initial Scoping – site visits
  - Walkover surveys (summer and winter)
  - Previous surveys (especially for past applications, consented or refused)
(Step 2) Plan and Refine

- Full field surveys can be undertaken to evaluate ornithological interest within proposed site boundaries.
- SNH have issued >20 items of guidance for developers and consultants, especially on survey methodologies;
  - Recommended bird survey methods to inform impact assessment of onshore wind farms
  - Monitoring the impact of onshore wind farms on birds
  - Assessing the cumulative impacts of onshore wind farms on birds
  - Breeding seasons for Scotland’s birds
There are two main broad survey types required

1. **Distribution and Abundance Surveys.** These are surveys to record numbers and distribution of breeding, wintering and migrant birds using the site. They will allow the evaluation of a site’s importance and provide information to help quantify predicted impacts from disturbance and displacement.

2. **Vantage Point (VP) Surveys.** These surveys comprise a series of watches from a fixed location to quantify the flight activity of birds at a proposed development site, which provides data to estimate the collision risk. See our Collision Risk Modelling guidance

https://www.nature.scot/sites/default/files/2017-09/Guidance%20Note%20Windfarms%20and%20birds%20Calculating%20theoretical%20collision%20risk%20assuming%20no%20avoiding%20action.pdf

3. **Key species:**
   - Annex 1 of the EC Birds Directive;
   - Schedule 1 of the Wildlife & Countryside Act 1981; and
   - Red-listed Birds of Conservation Concern.
Collision Uncertainty: Estimating Potential Collision Risk

- The likelihood of collision is one of the most significant unknowns. This is because:
  - There is little empirical evidence on collision probabilities for almost all species;
  - Collision probabilities cannot be reliably predicted from bird biometrics (e.g. wing-loading);
  - SNH therefore advocate precautionary approach, where there is limited empirical data.

- SNH have developed a Collision Risk Model that uses field survey data of flight behaviour to estimate future collision frequency. It is likely that for many species, collision probability is over-estimated, except for those species where we have reasonable data on actual collision likelihood.
We do not really understand why birds collide with wind farms. This limits our ability to predict with confidence collision likelihood.
Figure 1: The Structure of the Collision Risk Model

Bird behaviour:
- avoidance
- attraction

Bird flight activity:
- flight activity
- flight height distribution

Collision risk model:
- Collision risk:
  - birds/year
  - avoidance assumed

Significance of mortality

Turbine details:
- rotor diameter
- blade size and variation
- pitch and variation
- rotor speed

Bird details:
- body length
- wingspan
- flight speed
The model uses field data on flights in tandem with a spreadsheet that calculates the probability of collision for a bird crossing an operational turbine.
Modelling collision uncertainty

• The CRM is a deterministic model. It is not feasible to assess and compound errors arising from multiple parameters, with markedly different distributions. A simple approach to estimating the potential range of collision risk has been developed for offshore wind farms but has not been applied onshore.

• It is possible that a MCMC approach might be appropriate, but has yet to be tried.

• However:
  – The CRM is particularly sensitive to variation in the avoidance rate
  – Varying the avoidance rate for any species, is one way the likely variation in collision risk can be estimated. Avoidance rates ranging from 95% to 99.9% have been applied at some wind farms.
  – Although the default avoidance rate recommended by SNH is 98%, it is likely that most species’ avoidance rates are likely to be >99%.
(Step 3) Mitigation

- Implementation of management measures to enhance species conservation status on site, is used to mitigate any estimated residual impacts on species.

- Measures include:
  - Varying timing of construction (e.g. to time periods outside the breeding season)
  - Turbine shut-down during sensitive time periods
  - Management of habitat to prevent nesting and/or feeding close to turbines
  - Deterrents (e.g. line marking on power lines and met masts).
(4) Compensation

- Where residual effects cannot be mitigated, compensation may be considered.
  - Compensation has a very strict interpretation in the context of the EU Birds Directive
  - Compensation may involve habitat management elsewhere
  - Classification of alternative habitat for a species
  - Species management (e.g. control of predators – on or off site; INNS management etc.)

- Often suggested but rarely used in practice due to questions around its likely effectiveness.
Summary

- Effects on wind farm on bird species are still subject to high degree of uncertainty. To reduce uncertainty the assessment process aims to:
  - Avoid siting wind farms on or near sensitive sites
  - Use field observations of bird distribution and activity to assess likely effects for sites taken forward for development
  - Use modelling to make predictions from field data
  - Recommend mitigation where we cannot rule out residual effects arising from a development; or seek compensatory measures where residual effects cannot be mitigated.

- Overall, the process has seen most wind farm sites in Scotland developed with few adverse effects on bird populations observed.

- However, pressure for development may push developers towards more sensitive sites in the future, which underpins the need for better post-construction monitoring.
Compensation is the final stage in any assessment process. The conditions that need to be met are:

– There are predicted residual effects that cannot be mitigated;
– Compensatory measures can take place on or off site; and
– They seek to enhance species populations, as a means of offsetting any residual adverse impacts.

Compensation is a complex process, especially where there are Natura interests.

Examples can include:

– Habitat restoration and improvement;
– Direct species management (e.g. supplementary feeding);
– Removal of other adverse drivers of change such as INNS.