

Methodology proposal for a 24 month operational phase (post – construction) bat impact/mortality monitoring assessment

- For the Longyuan Mulilo De Aar Maanhaarberg Wind Energy Facility (WEF), Northern Cape

1. Introduction

Operational phase monitoring and research programs across North America and Europe have identified bats to be vulnerable to mortality due to wind turbines. Bats are particularly vulnerable to non-natural causes of mortality as they are long-lived animals with low reproductive fecundity. Additionally, there is relatively little scientific knowledge about bat populations and migration routes. It is recommended that a minimum of two year operational monitoring be undertaken as soon as turbines are functional, with auditing continuing throughout the lifespan of the WEF.

The primary objectives of the operational phase monitoring programme are to:

- Determine the bat fatality rates for the WEF
- Determine the fatality rates for species of concern
- Determine the fatality rates for migratory and resident bat species
- Study the relation of bat fatalities within all habitats, geology and vegetation types found in turbine areas
- Compare the bat fatality rates with those from wind farms in similar habitat types where possible
- Determine the relationship between bat activity and bat fatality
- Understand the relationship between bat fatality and weather conditions
- Study the temporal distribution of bat fatalities across the night and seasons
- Determine whether mitigation measures are necessary to reduce bat fatality rates, and if necessary recommend detailed mitigation measures

2. Methodology

Operational monitoring methodology is divided into two components, namely acoustic monitoring and carcass searches. **On conclusion of the first year an adapted methodology will be outlined for the second year of monitoring.**

2.1 Acoustic monitoring

Acoustics detectors and ultrasonic microphones will be used to monitor bat activity. They will be installed on the meteorological mast and/or a sub-sample of turbine nacelles to monitor activity in the rotor-swept path of high risk and select turbines.

2.2 Carcass searches

Carcass searches will be undertaken to determine bat fatality rates. This component of the methodology will be combined with that of the carcass searches for the bird monitoring programme.

Locals will be trained in proper search techniques to carry out the carcass searches and to record and collect all carcasses located. Searches will begin as early in the morning as possible to reduce carcass removal by scavengers. The order in which turbines are searched will ideally be randomly selected for each day to reduce carcass removal by predators from specific turbines before they can be searched.

All necessary information will be recorded when a carcass is found. The carcass will then be bagged and labelled and kept refrigerated for species identification and to determine the cause of death by the specialist, which will visit the site three times for the first year (to be adapted as needed for the second year). Fatality monitoring will be carried out over all seasons of the year.

The necessary searcher efficiency and scavenger removal trials will be carried out at least once per season to calculate field bias and error estimation.

3. Wind turbine mitigation

Data collected throughout the monitoring programme will be used to inform and direct mitigation if the WEF or specific turbines is found to be causing significant bat mortality. If

mitigations are implemented, monitoring the effectiveness of the applied techniques will be necessary to evaluate and refine the success and economic efficiency of the mitigation.

4. Deliverables

- Two monitoring reports will be submitted annually for the first year, on conclusion of the first year an adapted reporting and methodology schedule will be outlined for the second year of monitoring. Reports will include descriptions of the field protocols and sampling methods. Raw data will be included in the reports as appendices, and methods for data analysis shall be transparent.
- A contingency plan will be compiled which informs immediate actions to be taken in the case of a significant mortality event, or if mitigation measures fail. A contingency plan will consist of additional mitigation measures to be implemented in the event that significant negative impacts are observed from a single mortality survey.
- An adaptive management approach to the operational monitoring programme.

The study will be lead, overseen and all reports reviewed and signed off by Werner Marais and Monika Moir.

All efforts and compromises possible will be made to keep costs to a minimum without affecting the scientific robustness of the assessment or ability to reach the objectives of the assessment. The methodology of this assessment will comply with all current developments pertaining to the draft South African Good Practice Guidelines for Post-Construction Monitoring for Bats at Wind Energy Facilities, which will be a mandatory requirement for all specialists.