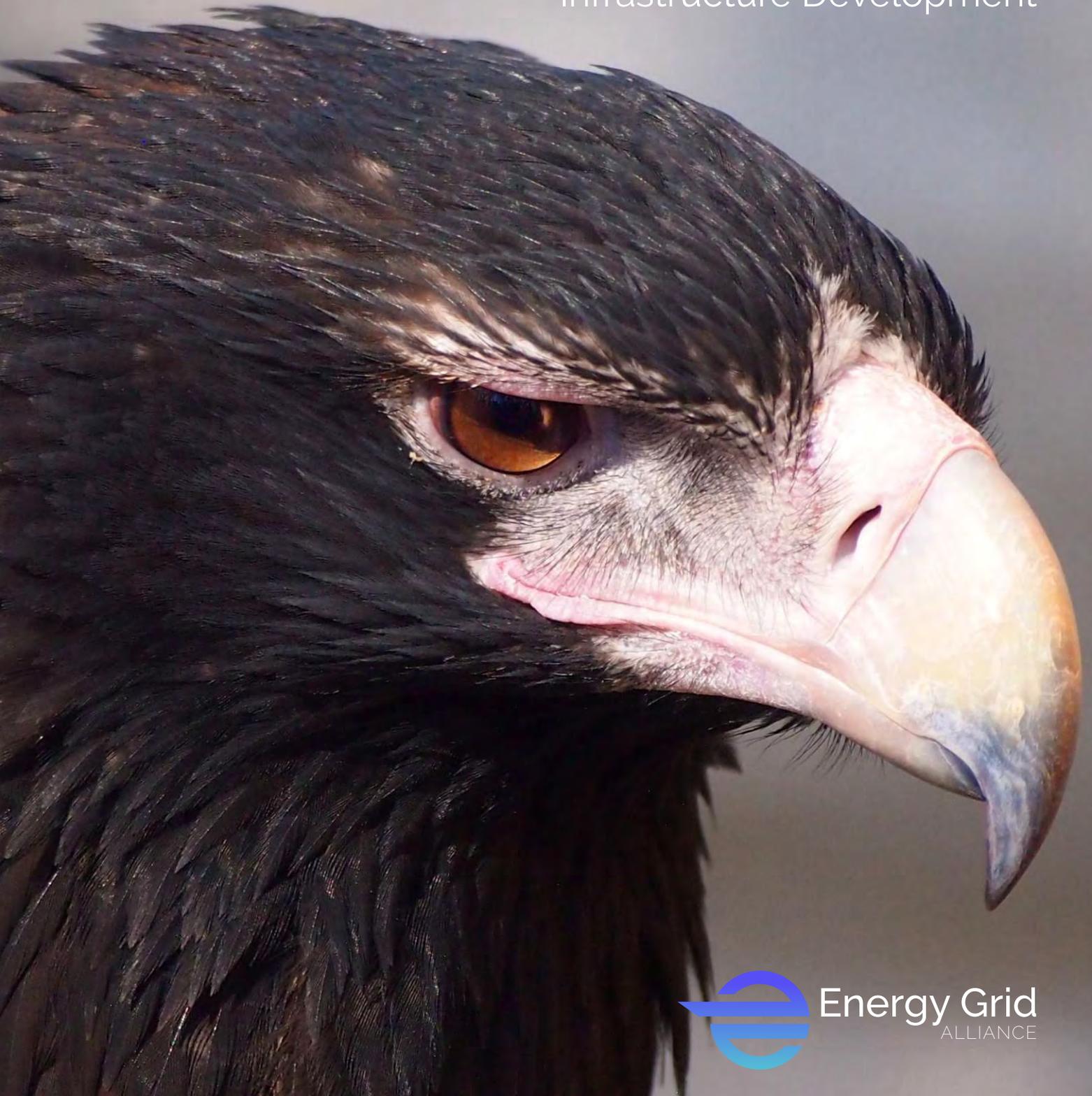


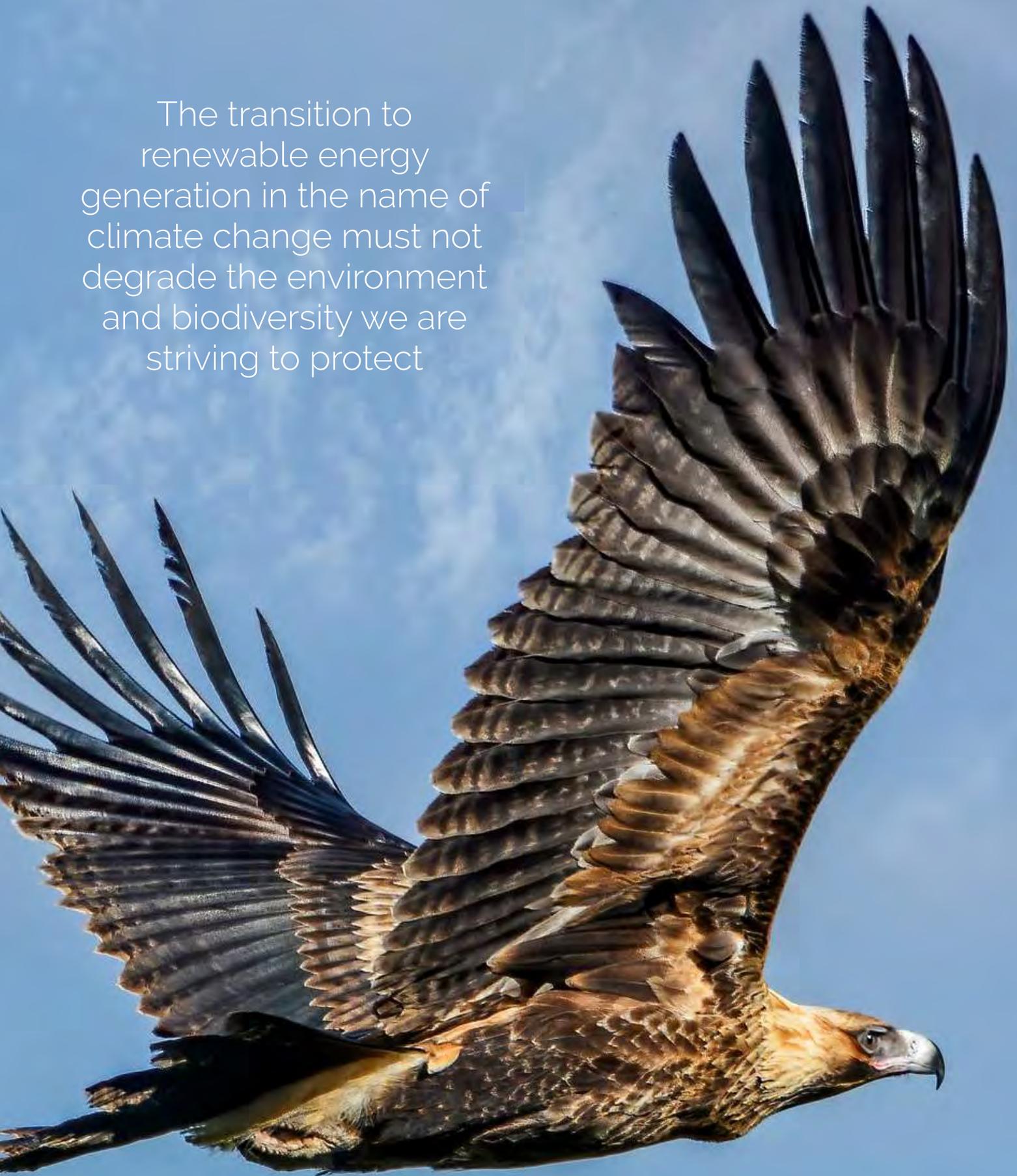
Wedge-tailed Eagle

(*Aquila audax*)

Best Practice Approach
for Electricity Transmission
Infrastructure Development



The transition to
renewable energy
generation in the name of
climate change must not
degrade the environment
and biodiversity we are
striving to protect



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The transition to renewable energy generation in the name of climate change must not degrade the environment and biodiversity we are striving to protect.



Wedge-tailed Eagle nest within proposed corridor of the WVTNP
Photo: Darren Edwards

Introduction

The Wedge-tailed Eagle (*Aquila audax*) is Australia's largest living raptor and one of the largest eagles in the world.

The Wedge-tailed Eagle is sensitive to disturbance and is affected by human activities including habitat clearing and construction activities in or near their territory. If a nesting eagle perceives a disturbance as a threat, even from hundreds of metres away, it may desert its nest site for years and long after the disturbance has ceased.

The proponent for the Western Victoria Transmission Network Project (WVTNP) is proposing to construct large-scale overhead electricity transmission infrastructure through regions of Western Victoria with a high density of active Wedge-tailed Eagles.

Wedge-tailed Eagles die or injure themselves through collision with the overhead powerlines or electrical structures. As increasing amounts of land and habitat is taken up by urban growth, inappropriately sited renewable energy projects and development of overhead transmission projects such as the WVTNP, the incidence of such collisions is certain to increase.

The proponent acknowledged the importance of avoiding impact to eagles when an alternate corridor, south of Bacchus Marsh, was dismissed due to likely impacts on Wedge-tailed Eagle populations along the Rowsley Scarp. This was based on precedents set in 2005 when a planning permit to build a 70 generator wind farm at Yaloak was refused, in order to protect eagles.

It is critical that electricity network planners seriously consider eagle nesting, territory and habitat requirements. Without a best practice approach, cumulative impacts of transmission infrastructure in active eagle territories could lead to high mortality rates and this species becoming regionally threatened.

While Wedge-tailed Eagles are not currently listed as a threatened species on the Australian mainland they are protected in Victoria under the Wildlife Act 1975 and must not be killed, hunted, poisoned, trapped or taken from the wild.

A precautionary principle should be applied when planning future overhead transmission infrastructure and wind energy facilities by avoiding areas of high eagle utilisation. Where Wedge-tailed Eagle territories cannot be avoided in open rural country, transmission lines should be routed underground to avoid ongoing disturbance, collision and electrocution risks.

The State Planning Policy Framework seeks to ensure that the objectives of planning in Victoria (as set out in Section 4 of the Planning and Environment Act 1987) are fostered through appropriate land use and development planning policies and practices which integrate relevant environmental, social and economic factors in the interests of net community benefit and sustainable development.

Wedge-tailed Eagle (*Aquila audax*)

The Wedge-tailed Eagle¹ is Australia's largest living raptor (bird of prey) and one of the largest eagles in the world. The Wedge-tailed Eagle has long wings (wingspan 2.3 m), a characteristic long, wedge-shaped tail, and legs that are feathered all the way to the base of the toes. The bill is pale pink to cream, the eye brown to dark brown, and the feet off-white. Females (4.2 kg - 5.3 kg) are also larger and heavier than males (3.2 kg up to 4.0 kg).

Habitat

The Wedge-tailed Eagle is found from sea level to alpine regions in the mountains, but prefers wooded and forested land and open rural country, generally avoiding rainforest and coastal heaths.

Distribution

The Wedge-tailed Eagle is found throughout mainland Australia, Tasmania and southern New Guinea.

Hunting for Food

Surrounding the territories are large home ranges in which the birds hunt for food but do not defend. There is usually overlap between the home ranges of two or more breeding pairs. Eagles can be seen perched on trees or poles or soaring overhead to altitudes of up to 2000m.

Breeding

Wedge-tailed Eagles are monogamous and mate for life. If one bird of a pair is killed, the survivor will find a new mate. Established breeding pairs are territorial and live in the one area throughout the year, defending around their nest sites from other Wedge-tailed Eagles.

Wedge-tailed Eagles build their nest in a prominent location with a good view of the surrounding countryside. It may be built in either a live or dead tree, but usually the tallest one in the territory. In some parts of Australia, where tall trees are absent, small trees, shrubs, cliff faces or even the ground may be used. The density of active nests depends on the abundance of prey and other resources. In most years, nests are usually 2.5km - 4km apart. If conditions are particularly good, the distances apart may be less than 1km because the birds require smaller areas to find sufficient food.



Photo: BeccaH from Pixabay

Conservation status

While Wedge-tailed Eagles are not currently listed as a threatened species on the Australian mainland they are protected in Victoria under the *Wildlife Act 1975*² and must not be killed, hunted, poisoned, trapped or taken from the wild.

In May 2020, the Minister for Energy, Environment and Climate Change announced a comprehensive review³ of the *Wildlife Act* following the deaths of more than 400 wedge-tailed eagles at a remote farm in East Gippsland⁴. The systematic poisoning put at risk the breeding capacity of future generations of the species across Australia⁵.

Environment Minister Lily D'Ambrosio said she was "appalled" by the case and that community expectations had changed since the Victorian *Wildlife Act* was drawn up in 1975. She has ordered her department to compare Victoria's laws to those in other states. "My aim is to have the best wildlife act in the country with all of the necessary penalties available to ensure our wildlife are protected," Ms D'Ambrosio said.

The Tasmanian subspecies is endangered due to the disturbance and loss of nesting sites: at least 40% of forests and dry woodlands have been cleared in Tasmania since settlement.⁶



Photo: Adam Kereszy

Threats to Wedge-tailed Eagles

The Wedge-tailed Eagle is affected by human activities and is sensitive to forestry operations, habitat clearing, mining operations and construction of infrastructure in or near their territory.

The main threats to Wedge-tailed Eagles are tree-clearing and the loss of nesting sites; secondary poisoning⁴; collision with overhead wires⁷, wind turbines⁸, fences, and with vehicles while eating road kill.

Disturbance

If a nesting eagle perceives a disturbance (visible or audible) as a threat, even from hundreds of metres away, it may leave its eggs or chicks at risk of cold, heat and predation. It may desert its nest site for years and long after the disturbance has ceased⁹.

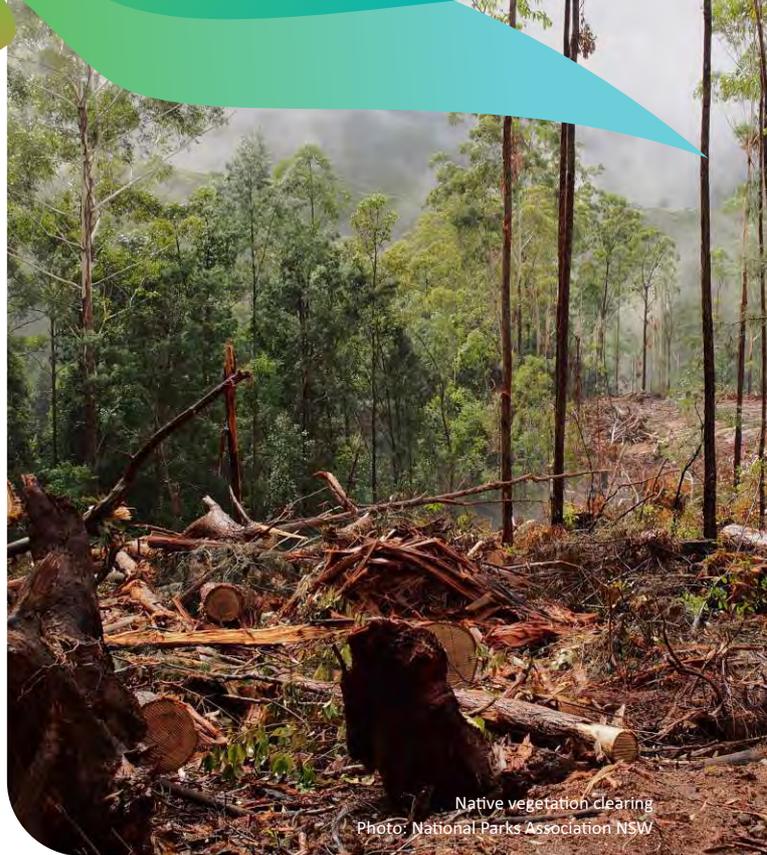
A disturbance is more likely to disrupt breeding if: visible; louder; more intense; closer (either vertically or horizontally); over a longer period; more frequent; across a larger area; earlier in the breeding season; above the nest; people are visible; people are looking towards the nest; during the day; helicopters are involved; during extreme weather.

Wedge-tailed Eagles vary in their tolerance levels, and some may eventually nest in areas near certain levels of regular disturbance after some months or years spent assessing an area. However, a small additional disturbance may then be 'the straw that breaks the camel's back', i.e. enough to disrupt breeding, sometimes for years.

Eagles are more tolerant of ongoing disturbance that began in an area before they started nesting, than they are of disturbance that is introduced once they are nesting.

Disturbance can include but is not limited to:

- People or loud machinery too near the nest during the breeding season ('too near' can be many hundreds of metres if in direct line of sight of the nest)
- Commercial development near nesting habitat. This can include construction of renewable energy facilities and associated infrastructure such as overhead transmission lines
- Residential development near nesting habitat
- Investigating nests during the breeding season.



Native vegetation clearing
Photo: National Parks Association NSW

Removal of vegetation

As the same nest may be used intermittently by the same breeding pair over decades, removal of nest trees or surrounding vegetation can result in eagles abandoning their territory completely.

The Tasmanian Government¹⁰ is encouraging foresters and other land managers to retain at least 10 hectares of bush around nest sites to ensure more nests will remain active. These actions are being included in Forest Practices Plans as a result of Tasmania's Forest Practices Code¹¹.

Proximity of infrastructure

In New South Wales, the Department of Planning, Industry and Environment recommends a buffer of 500m around Wedge-tailed Eagle nests to any wind farm facility as eagles are at greatest risk when young and first flying¹².

The same buffer should apply to transmission infrastructure from nesting sites as the most effective way to manage impacts is through avoiding high risk locations.



Easement vegetation management

Threats from Overhead Transmission Infrastructure

The Victorian Government has set ambitious targets to reduce the state's greenhouse gas emissions from 2005 levels by 50% by 2030¹³. Increased use of wind energy and development of large scale electricity transmission is a significant component of this commitment.

The assessment of potential impacts on birds and bats is now a routine consideration in commercial-scale wind and energy projects in Victoria due to the possibility of in-flight collisions with wind turbines or associated transmission infrastructure.

Fast flying birds of prey such as the Peregrine Falcon can reach speeds of 232 km/hr in a dive and can sustain fatal wing injuries if a powerline is hit. Even slower moving species such as the Wedge-tailed Eagle can be injured by colliding with powerlines¹⁴.

Most birds of prey are injured as a result of human related causes, through our technology and our way of life. Urbanisation, habitat destruction, traffic, powerlines, and wind turbines can all impact on raptors in one way or another.

A common injury from powerlines is a broken humerus wing bone. Depending on where the break occurs determines the likelihood of successful treatment or not. Breaks occurring in the middle of the bone being easier to pin whereas breaks near the joint are very difficult to treat.

High levels of mortalities have been recorded at some international wind farms (Frick et al. 2017; Hayes 2013; Lehnert et al. 2014), but the reported mortality rates are highly variable, and there remains uncertainty about the impact of Victorian wind farms and transmission infrastructure on bird and bat populations as many may be unknown or not reported.

Notwithstanding the uncertainty over the number of mortalities, in a review of mortality reports from utilities, wildlife rehabilitators and falconers between 1986 and 1996 in the US, 1450 raptor electrocutions representing 16 species were confirmed. (Harness and Wilson 2001). It is estimated in the US that transmission lines lead to a fatality estimate of approximately 130 million birds per year.¹⁵



Wedge-tailed Eagle death as a result of transmission line strike
Photo: Raptor Refuge

In Tasmania, the number of wedge-tailed eagles dying after coming into contact with electricity network infrastructure increased by more than 140 percent from 2017-18, TasNetworks Annual Report¹⁶ reveals. In 2019-20, TasNetworks reported 18 threatened bird incidents, compared to 24 the previous year and 33 in 2017-18. While mortality rates may have declined in recent years, these figures may be underestimated as many deaths would not be known. Whatever the statistic, Wedge-tailed Eagle populations continue to be killed as a result of flying into transmission lines or when perching on infrastructure.

Fast-flying raptors die or injure themselves through collision with the wires or electrical structures. As increasing amounts of land are taken up by rural development, the incidence of such collisions is likely to increase¹⁷.

Research shows that overhead powerlines in flat, open areas are high-risk for Wedge-tailed Eagles. Risks of collisions with tall structures where the structure is difficult for an eagle to perceive in flight (e.g. powerlines, horizontal axis wind turbines, guy wires)¹⁸.



Photo: Nick Mooney



Wedge-tailed Eagle

Active Wedge-tailed Eagle Territory

The topography and local environment in the vicinity of Bacchus Marsh is highly suitable for Wedge-tailed Eagles particularly due to the proximity of the forested State and National Parks. The open agricultural land, escarpments, plateau complex and consistently available updrafts provide reliable aerial environments for soaring, cleared land for hunting and protected habitat for breeding.

Rowsley Scarp

The Rowsley Scarp¹⁹ is a long tectonic fault line that rises 230m above the sunken flat lands and sweeps from Bacchus Marsh in the north to near Anakie in the south, where it tapers out to join the valleys of the Moorabool River and Sutherland Creek. The Scarp forms the eastern edge of the Brisbane Ranges.



Rowsley Scarp - Significant Landscape



Wombat-Lerderderg National Park - Significant Landscape

Wombat-Lerderderg National Park

Lerderderg Gorge and State Park²⁰ (future Wombat-Lerderderg National Park) lie to the north of Bacchus Marsh. The landscape echoes the mosaic of habitats, landforms and dramatic changes in topography to that of the Rowsley Scarp.

The Lerderderg rises over 400m above the flat volcanic plains near Bacchus Marsh and is clearly defined through steep changes in topography. The eastern edge of the park is by the cleared landscape of the Goodmans Creek Valley, and to the south it is edged by the outskirts of Bacchus Marsh (Darley) and the cleared hills and valleys of Pentland Hills.

These significant landscapes and their unique features combine to provide the ideal territory that facilitate a relatively high density of active Wedge-tailed Eagles.

The Park is important for the conservation and protection of breeding habitats of the Peregrine Falcon and Wedge-tailed Eagle and should not be disturbed. Parks Victoria encourage monitoring of Wedge-tailed Eagle populations to establish effective habitat management strategies.

Impact of Disturbance

Studies conducted in the Bacchus Marsh district in 1999–2000²¹ identified 14 nests with 7 containing active breeding pairs. Further studies suggest that breeding pairs of Wedge-tailed Eagles are sensitive to human disturbance and readily abandon nests, even after minimal disturbance²².

Observations generally confirmed previous findings that Wedge-tailed Eagle can react to disturbance at distances of <450m from nests. Even removal of dead trees, often used as a focal perch, in a nesting territory may render a nest-site less desirable and lead to desertion. Findings indicate that activities within this range should be avoided to lessen the impact on future eagle populations. These findings align with those of the Tasmanian and New South Wales Governments.



Waterloo Windfarm SA - Eagle Death
Photo: Vanessa Hunter

Yaloak Wind Farm, Victoria

Planning Permit Refused

Precedent was established, for the protection of eagles, in 2005 when a planning permit to build a 70 generator wind farm at Yaloak, south of Ballan, was refused²³ based on the findings of an independent panel.

The panel recommended that the developer not be granted a permit because the proposed development posed an unacceptable risk (predicted 3-4 deaths per year) to the Wedge-tailed Eagle population. The panel also expressed concerns about the high landscape and visual amenity impact of locating the proposed wind generators on top of prominent slopes at the head of the Parwan Valley and the potential effects of this on nearby residents.

The project proposal did not comply with strict standards and safeguards the Victorian Government has in place to protect environmental values and rural communities. The adverse environmental impacts were far too great.

Revised plans approved

Revised plans for a dramatically scaled back operation, sited away from the Rowsley Scarp to reduce avian impact, were approved in 2010 by the then Minister for Energy and Resources. The advisory Committee Report²⁴ concluded that the predicted impact on the Wedge-tailed Eagle from the scaled back operation and revised location does not provide a basis for refusal of the application.

The smaller wind farm, which consists of 14 turbines, began operations at a site 15 kilometres south of Ballan in 2018. The Yaloak South site has wind turbines that are 80m high with the blade tips going up to 126.5m. The tips of the turbine rotors can reach up to 250km/h during rotations, making them mortally dangerous for passing birdlife and bats.

A survey report²⁵, commissioned during the first year of operation(2018-19), recorded a total of 391 Wedge-tailed Eagle flights, with eagles recorded around the site during all 12 months.



Eagle Death Tasmanian Wind Farm

Wedge-tailed Eagles killed

4 Wedge-tailed Eagles were killed during the survey period²⁶ by wind farm infrastructure. A reduction in breeding activity in comparison to pre-construction data was also noted. During the 2019-20 survey period it is estimated that a further 3 eagles were killed²⁷.

Despite being protected, 7 eagles killed is not considered by the Yaloak South Wind Energy Facility to have a negligible impact to the population of eagles.

While this is concerning, even more so is the strategy in the Bird and Bat Management Plan for the Yaloak South site that strikes could be mitigated by removing of carrion, livestock, **native animals** and pest animals that might attract raptors to turbine areas.

While the transition to renewable energy is important, a more environmentally sensitive approach would be to site overhead infrastructure well away from known eagle territories.



Proposed High-Voltage Overhead Transmission Infrastructure

Western Victoria Transmission Network (Proposed)

The Western Victoria Transmission Network Project²⁸ (WVTNP) is a proposed new 190km overhead high-voltage electricity transmission line that will carry renewable energy from Bulgana in western Victoria to Sydenham in Melbourne's north-west. Moorabool Shire²⁹ is earmarked for 60km of the 500kV lines from the eastern boundary to the west. Tower structures will range in height from 60-80m through this section.

The proposed overhead transmission line fragments areas of native bushland on both freehold and public land. Many of these areas have high quality remnant vegetation for shelter and nest sites that actively supports Wedge-tailed Eagles, threatened species and other native fauna.

Parks and reserves known to support Wedge-tailed Eagles, in proximity to the proposed transmission line include:

- Lerderderg State Park (proposed Wombat-Lerderderg National Park)
- Wombat State Forest
- Long Forest Nature Conservation Reserve

Wedge-tailed Eagles are regularly observed in and around these parks and much of the surrounding areas with hundreds of eagle sightings annually³⁰. (See Figure 1) Overhead transmission infrastructure through this region, within 500m of nesting sites and clearing of remnant vegetation is highly inappropriate.

Studies of nest-site characteristics conducted in the Bacchus Marsh district in 1999–2000³¹ conclude that site selection by Wedge-tailed Eagles in this region appears to be more specific than previously believed.

Land managers need to take nesting requirements of the eagles into account when developing future management strategies. It is also critical that electricity network planners consider eagle nesting and territory requirements as cumulative impacts of transmission infrastructure and wind farms in this region could lead to high mortality rates and this species becoming regionally threatened.



Wedge-tailed Eagle Nest within proposed WVTNP transmission corridor
Photo: Darren Edwards

The WVTNP has access to a range of feasible alternatives³³ that deliver the identified need with superior environmental outcomes. These alternative must be explored.

The loss of raptors from in-flight collisions with overhead transmission infrastructure, or disturbance during construction and maintenance, is a major ecological concern. Local eagle populations regulate the food chain and maintain a stable equilibrium in nature. Predator-prey relationships can be complex, and removing a top predator can alter the balance of an entire ecosystem. In this case it could lead to a boom in small pest populations, e.g. rabbits, which would in turn lead to further degradation of the environment.

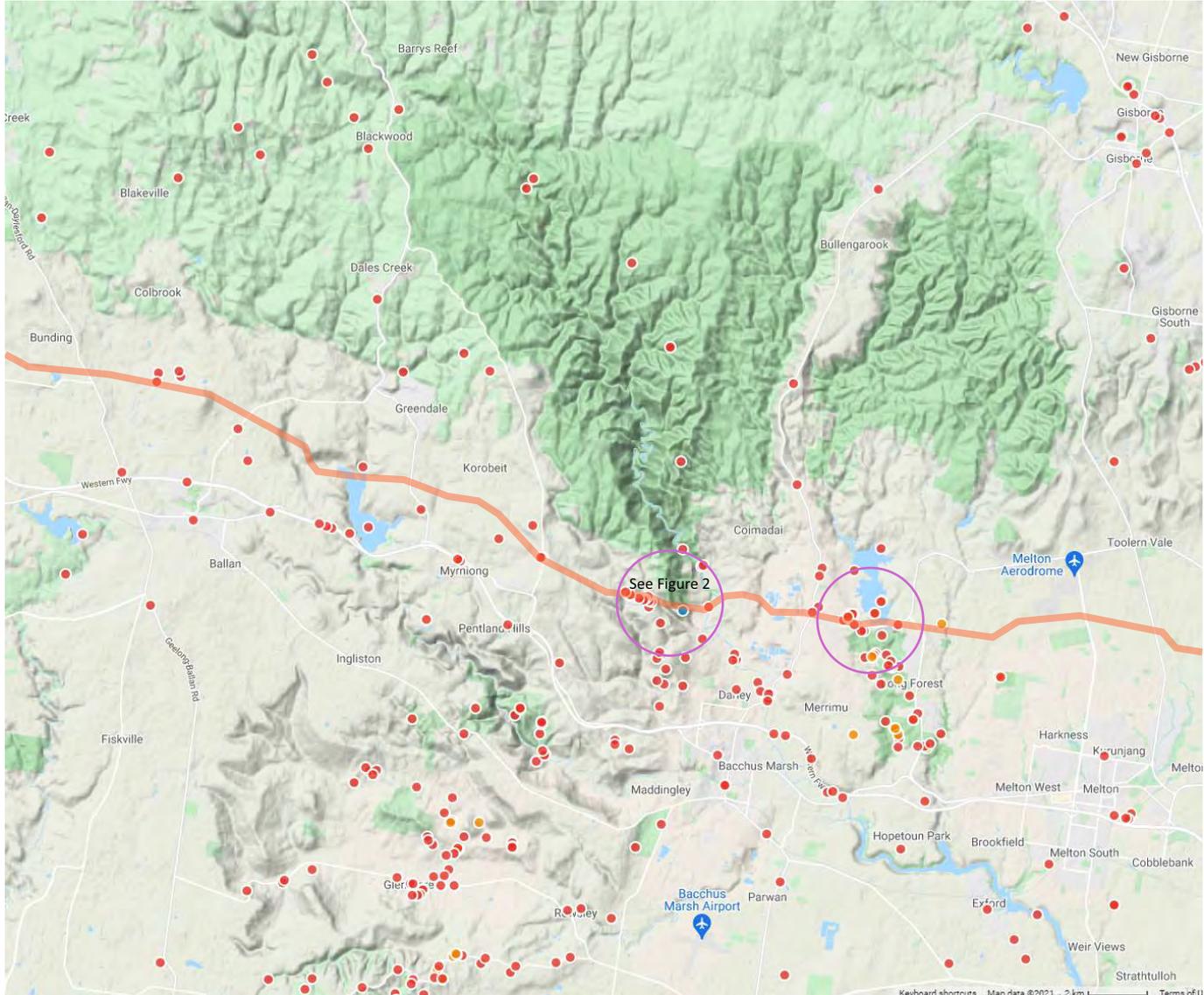
The transition from coal-based to renewable energy is one of the key challenges of the 21st century. Conversion of the energy supply system must, however, be designed to minimise the impact on the environment and landscape and take account of human needs. This coupled approach was demonstrated at COP26 where efforts to reduce fossil fuel use were set alongside the Glasgow Leaders' Declaration on Forests and Land Use³³, with 141 countries agreeing to halt and reverse forest loss and land degradation by 2030.



Proposed High-Voltage Overhead Transmission Infrastructure

Western Victoria Transmission Network (Proposed)

Figure 1 | BirdLife Data - Observations of Wedge-Tailed Eagles and Nests | Data date 11/02/2022



Map generated 21/12/2021 - Not to scale

- Proposed final overhead transmission corridor.
- Areas with high concentration of Wedge-tailed Eagles where significant vegetation removal and disturbance could result in adverse impacts on eagle populations



Proposed High-Voltage Overhead Transmission Infrastructure

Western Victoria Transmission Network (Proposed)

Figure 2 | Proposed Transmission Corridor on the Southern Boundary of the Lerderderg State Park



Artistic impression of transmission infrastructure in the proposed corridor alongside the Lerderderg State Park.

500kV towers will range in height from 60-80m depending on topography with an easement width of 70-100m. Native habitat and mature trees will need to be cleared to a maximum height of 3m. For vegetation above 3m in height, a safety assessment is required to ensure that minimum clearances and fuel load densities are maintained. Maximum height cannot exceed 8m. Trees and shrubs would be scattered or clumped with no more than 10% density of cover over the easement area.

Best Management Practices

Transmission network planners should develop best management practices to not degrade the environment and biodiversity we are striving to protect.

A key element to a risk reduction plan would be the implementation of best management practices to minimise disturbance near eagle concentration areas, nests, winter roosts, and minimise risk along migration corridors and flight paths.

Habitat risk assessment or predictive relative abundance modeling can help define the likelihood of eagle presence at any particular location in an area of interest. Habitat risk can incorporate local factors of known importance to the species.

Risk assessment may involve associating bird observation data with nesting and foraging habitat in addition to land features strongly correlated with the presence of eagles.

The product of a habitat risk assessment can be a weighted geospatial map based on a numeric scale representing likelihood of eagle presence based on abundance of habitat and land features present. A scale must be assigned to the habitat and structural risk in order to establish a hierarchy of avoidance/mitigation measures in order to optimise Wedge-tailed Eagle protection efforts.

Recommendations

Network planners should conduct habitat risk assessment or predictive relative abundance modeling to define the likelihood of eagle presence at any particular location and develop the most appropriate avoidance strategy.

A precautionary principle should be applied when planning future overhead transmission infrastructure and wind energy facilities by avoiding areas of high eagle utilisation.

A **500m buffer** should be established around Wedge-tailed Eagle nests to any overhead transmission infrastructure and wind energy facility to avoid disturbance, ensure nests remain active and avoid adversely impacting eagle populations.

At least **10 hectares of bush** be retained around nest sites to ensure more nests will remain active.

Where Wedge-tailed Eagle territories cannot be avoided in open rural country, transmission lines should be routed underground to avoid collision and electrocution risks.

Wedge-tailed Eagles are protected under the Wildlife Act 1975 and must not be killed. The energy supply system must recognise this and be designed to minimise the impact on the environment, landscape and biodiversity.



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Energy Grid Alliance was established with the purpose of engaging with energy transmission companies, industry regulators, market operators, relevant peak bodies, government and communities to establish best planning practices for new energy transmission infrastructure and to inform on the benefits of working with communities to acquire and maintain social license.

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Wedge-tailed Eagle Nest - Konkuperrimul Creek
Photo: Nathan Lidgett