Minimising Environmental Effects of Energy Transmission Networks

Discussion Paper | June 2021

Energy Grid ALLIANCE

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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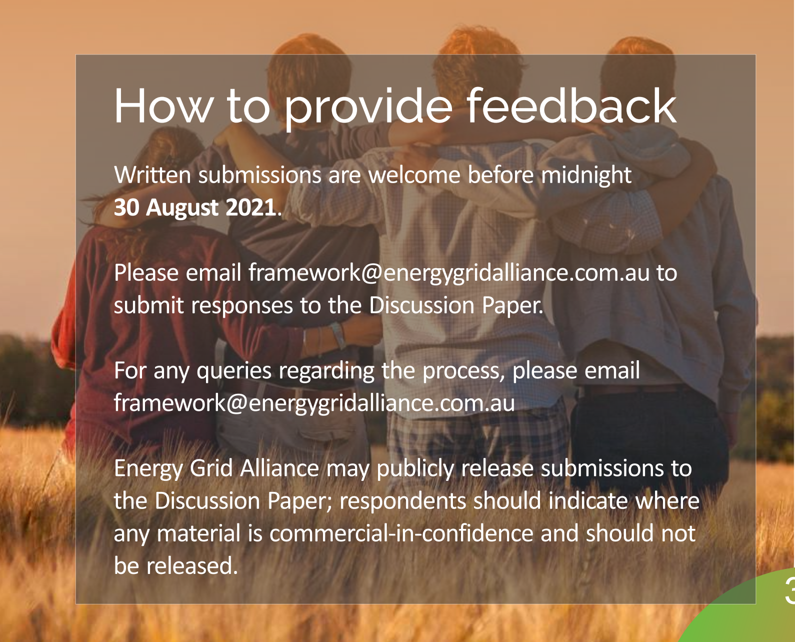


How to provide feedback

Written submissions are welcome before midnight **30 August 2021**.

Please email framework@energygridalliance.com.au to submit responses to the Discussion Paper.

For any queries regarding the process, please email framework@energygridalliance.com.au

Energy Grid Alliance may publicly release submissions to the Discussion Paper; respondents should indicate where any material is commercial-in-confidence and should not be released.

Purpose

The purpose of this paper is to develop consistent investment assessment framework to facilitate early identification of project risks and potential impacts. Applying enhanced regulatory framework during a project's inception may avoid or mitigate many of the risks associated with selecting broad areas of interest or multiple corridors without truly understanding a project's impact.

This framework should be applied during the Regulatory Investment Test for Transmission (RIT-T), as well as recently legislated State-regulated Assessment Tests, and also to 'in development' projects that have proceeded beyond these tests.

Involving the community in the route selection process and adopting community supported guidelines will further reduce excessive delays resulting from community conflict and push-back.

Mitigating the impacts of energy transmission networks early will simplify the complex energy transmission routing process and will streamline and expedite new network investments.

Section 1 of this paper discusses the current regulatory framework for new energy transmission and proposes enhancements to this framework to improve viability and expedite project delivery. This section also provides an overview of current and future projects where this community supported framework should be applied.

Section 2 of this paper contains a brief discussion of the types of environmental impacts associated with transmission lines. It also includes a summary of key considerations in transmission line route selection and discusses community supported best practices for project design.

Section 3 of this paper discusses widely accepted and community-guided approaches and best practices for assessing and mitigating impacts associated with the routing, siting, construction, and operation of high-voltage energy transmission and associated facilities.

Section 4 of this paper discusses the importance of early community involvement and informs on the benefits of working to acquire and maintain social license. This section also contains a summary of internationally guided 'Prudent Avoidance' practices for siting energy transmission infrastructure.

1

Regulatory Framework and Background Information

Section 1 of this paper discusses the current regulatory framework for new energy transmission and proposes enhancements to this framework to improve viability and expedite project delivery. This section also provides an overview of current and future projects where this community supported framework should be applied.

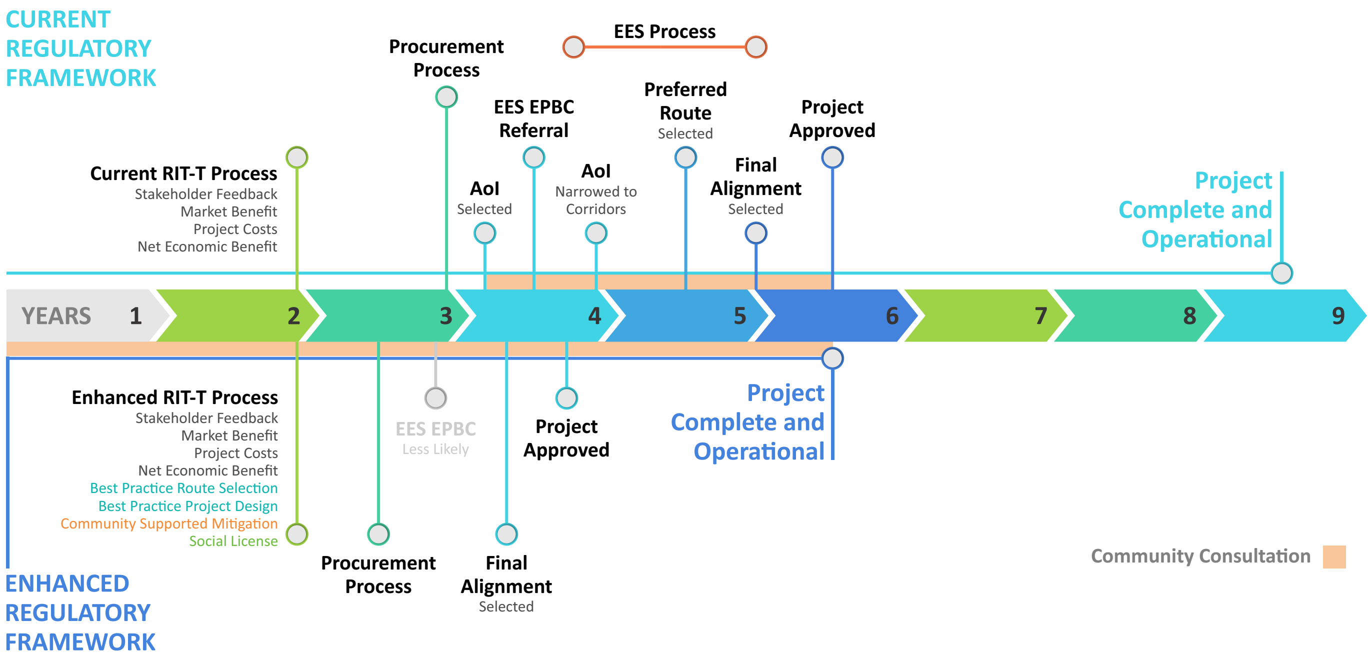
Providing certainty to streamline transmission projects and network investments

1.1 Executive Summary

Victorians require a more resilient transmission network that will increase the supply of low-cost renewables, balance intermittent wind and solar resources, help meet diverse demand peaks and insure against the increasing unreliability of coal-powered generators. At present, however, investments in Victoria's transmission network are being held up by a ***complex regulatory regime that subjects transmission projects to excessive delays***. Push-back from communities, concerned about the impact of overhead energy transmission is also becoming recognised as a major delay factor with escalating cost impacts on projects. This community opposition adds further delays and signals a new challenge that will be faced by every new transmission project unless an **enhanced regulatory framework** is adopted, and community stakeholders actively participate in the decision-making process.

This as an opportunity to develop an **innovative community guided approach** that seeks to mitigate socio-economic and environmental impacts during the projects inception. This will minimise or eliminate material project delays and costs. Adopting this framework will streamline infrastructure investment and increase the overall net benefit to Victorian economy and energy consumers.

Fast Tracking Energy Transmission Projects and Network Investments



Project delivery can be streamlined and fast tracked by understanding the risks and project impacts during the projects inception. Route selection can then avoid sensitive areas that may trigger and EES or EPBC Act referral.

Involving the community early in the route selection process, avoiding selection of multiple corridors and adopting community supported guidelines will further reduce excessive delays resulting from community conflict and push-back.

Note: Time frames and processes are based on the Western Victoria Transmission Network Project (WVTNP) and are not representative of all transmission projects.

1.2 Current Regulatory Framework

INCEPTION

Regulatory Investment Test for Transmission (RIT-T)

A fundamental concern with the current regulatory framework applied to the RIT-T process is that the **net economic benefit** equals the **market benefit** less **project costs**, it does not consider socio-economic, environmental disbenefits or community concerns, the Triple Bottom Line (TBL).

Considerations

- Stakeholder Feedback
- Market Benefit
- Project Costs
- Net Economic Benefit

The RIT-T does not consider socio-economic or environmental disbenefits

2 YEARS

Procurement Process

Proponents are invited to tender on a project where risks, impacts and community concerns have not been investigated and are not understood.

Call for Expressions of Interest (CEI) → Invitation to Tender (ITT) → Contract Awarded to Proponent

3 YEARS

Area of Interest (AoI) Selected

This is often the first opportunity for engagement with community to understand potential impacts. Community push-back adds unnecessary delays and increased project costs.

An Area of Interest (AoI) is identified by the proponent based on a range of technical investigations, desktop analysis and mapping to identify and avoid areas of sensitive activities, high environmental value and high heritage value.

Environment Effects Statement (EES) EPBC Act Referral

Minister for Planning determines if proponent to required to prepare an EES under the Environment Effects Act 1978 and a referral to the Commonwealth Minister for the Environment under the EPBC Act.

3.5 YEARS

EES Process

The EES process adds risk the project may not receive approval to proceed. Understanding potential impacts would be more advantageous during the RIT-T process so a referal to the EES process can be avoided.

Final EES Scoping Requirements → EES Consultation Plan Prepared → Technical Reference Group (TRG) Formed

4 YEARS

AoI Narrowed to Potential Corridors

Community consultation is often dismissed in favour of the impacts being identified during the EES process.

The proponent narrows down the Area of Interest to corridors. These corridors will be considered, along with the output of further community consultation, to identify to a single corridor and refine a final route for the Project.

4 YEARS

Preferred Route Selection

Community consultation is often dismissed in favour of the impacts being identified during the EES process.

The proponent narrows down to a project corridor and continues detailed studies. A preferred route and location of the new infrastructure, including transmission lines, towers and a terminal station is then selected.

4.5 YEARS

Final Preferred Alignment Selected

Community has the opportunity to contest the findings of the EES process. A lengthy and often expensive exercise.

Following detailed impact assessment, including a report on how community feedback has shaped the project, a final preferred alignment is submitted to government to assess the project.

4.75 YEARS

Project Approved to Proceed

Final project route determined following a government decision to progress the project.

5.5 YEARS

8.5 YEARS

Project Complete and Operational

1.3 Considering the Triple Bottom Line

As Victoria's ageing coal-fired generation is retired, it will increasingly be replaced by wind and solar in different locations. Stronger transmission networks will be needed to move the power around the system locally and interstate. Increasing the capacity, stability and resilience of existing transmission interconnectors or high voltage lines can lead to more customers accessing cheaper and more reliable electricity.

The need for an effective and efficient transmission network to transfer energy generated in renewable energy zones to the State power grid is recognised but it is fundamental the impacts on environment and community be considered at the inception stage of the project.

General practice for new high voltage overhead transmission lines is to route in straight lines and turn corners as few times as possible without consideration of socio-economic or environmental concerns. This generally satisfies the RIT-T framework, the purpose of which is to identify the transmission investment option which maximises net economic benefits and, where applicable, meets the relevant jurisdictional or Electricity Rule based reliability standards.

A fundamental concern with the current regulatory framework applied to the RIT-T process is that the net economic benefit equals the market benefit less costs, it does not consider socio-economic or environmental disbenefits, the Triple Bottom Line (TBL).

Linking our society and economy to the environment

Biodiversity is not accounted for and managed across the economy. Many businesses have no measures or evidence showing the link between good management of natural capital and a productive economy, and as a result fail – or demonstrate limited ability – to account for the full environmental cost of their decisions.

The use of environmental-economic accounting will help reveal the linkages between natural capital, society and the economy, and identify risks and opportunities for Victoria.

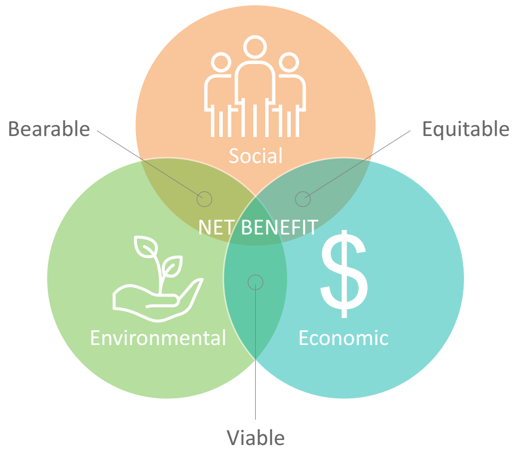
(Protecting Victoria's Environment – Biodiversity 2037 - DELWP: Chapter 5)

Route selection should try to avoid, minimise, or offset impacts on important environmental, social, cultural and landscape values and avoid community and land use conflict by **utilising existing rights-of-way** and considering new/emerging technologies such as **undergrounding as a preferred transmission option**. Feasibility of the preferred route should be determined early using GIS desktop analysis.

Under the current regulatory framework, community consultation, impact avoidance and mitigation measures are dealt with by the proponent, often through the Environment Effects Statement (EES) process, the most rigorous environmental impact assessment process in Victoria. This often-lengthy process results in material project delays, increased costs and increases the risk the project will not proceed at all. This then impacts the Victorian economy, energy infrastructure investment, communities and Victorian energy consumers.

By avoiding and/or mitigating obvious impacts as part of the inception (project design) stage, prior to tendering the project, the EES process, if required at all, would streamlined.

Triple Bottom Line



The triple bottom line is a sustainability-based accounting method that focuses on people (social), profit (economic) and planet (environment).

The triple bottom line differs from existing regulatory framework as it also considers social and environmental aspects in the overall net project benefit.

Applying this method of assessment to the RIT-T process will hold energy regulators and proponents to account for the projects social, environmental and economic impact.

1.4 Enhanced Regulatory Framework (Proposed)

INCEPTION

Regulatory Investment Test for Transmission (RIT-T)

By considering socio-economic and environmental impacts, community feeback, best practice route selection and planning during the RIT-T process, a final preferred alignment can be proposed (rather than a broad corridor). This provides greater certainty the project will proceed.

Considerations

Stakeholder Feedback	Community Feedback	Best Practice Planning	Strategic Route Selection
Socio-economic and Environment	Market Benefit	Project Costs	Net Economic Benefit

2 YEARS

Procurement Process

Proponents are invited tender on a project with greater certainly as risks, impacts and community concerns have been investigated and are understood. Acquiring Social License should be a formality.

Call for Expressions of Interest (CEI) → Invitation to Tender (ITT) → Contract Awarded to Proponent

2.5 YEARS

Environment Effects Statement (EES) EPBC Act Referral

Using best planning practices, existing easements, undergrounding and community guided avoidance techniques, the proponent is less likely to be required to prepare an EES under the Environment Effects Act 1978 or a referral to the EPBC Act.

Final Preferred Alignment Selected

Applying community accepted guidelines during the projects inception will enable the project to proceed with minimal opposition.

Following extensive community consultation and impact assessment, a final preferred alignment and location of the new infrastructure, including transmission lines, towers and a terminal station is then submitted to all stakeholders to assess the project.

3 YEARS

Project Approved to Proceed

Final project route determined following a government decision to progress the project.

3.5 YEARS

5.5 YEARS

Project Complete and Operational

New Planning Rules - 20 May 2021

New planning rules developed by the Energy Security Board (ESB) were passed into law on 13 May 2021. They require both the needs of communities and developers to be considered in renewable energy zone (REZ) design; and align the REZ objectives being pursued at a state level with the actionable Integrated System Plan to ensure REZ developments are part of the optimal development path for the broader power system.

The design reports must include proposed designs, construction route, cost estimates, consideration of non-network alternatives and a community impact assessment to give local people opportunities to put forward relevant information.

The new comprehensive REZ design reports will be triggered by AEMO decisions to implement a priority transmission infrastructure project under the ISP's overarching cost benefit analysis and risk assessment.

National Electricity (Victoria) Amendment Bill 2020

The Victorian parliament has passed new legislation (24 March 2020) that gives the state greater control over new energy infrastructure investment and to side-step certain national energy market rules.

The new powers effectively allow the Victorian energy minister, Lily D'Ambrosio, to exempt certain investments in new transmission infrastructure from the usual assessment tests, including the regulatory investment test for transmission (RIT-T).

Under the new laws, the Victorian energy minister will be required to consult with AEMO as well as the state's premier and treasurer before making an order to streamline new network investments. When this power is utilised, it will be important to demonstrate that risk and impact assessments have been completed as part of the project inception (by those skilled to do so), providing clarity to key decision makers.

1.5 Context

The electricity system supporting Australia's modern economy and lifestyle is experiencing change on an unprecedented scale.

Victorian Renewable Energy Zones
The Victorian Government is committed to the development of its Renewable Energy Zones (REZs). The purposeful development of REZs will allow new renewable energy projects to be connected in a timely manner, reducing risk premiums for investors, achieving better energy affordability and reliability outcomes for consumers, helping to achieve our climate change goals and furthering regional economic development goals. Victoria is delivering on an ambitious agenda to increase the share of electricity produced from renewable sources. The Victorian Government has legislated renewable energy targets (VRET) of 25 per cent of electricity generation by 2020, 40 per cent by 2025, and 50 per cent by 2030.

The 2020 target has been achieved and we are on track to achieve the 2025 and 2030 targets. Significant investments have been made to support the achievement of the VRET, including the Victorian Renewable Energy Auction Scheme which has contracted for 928MW installed generation capacity. This year, the Government will be holding its second VRET auction, to deliver at least 600MW of additional renewable generation.

The Government has also partnered with industry to implement large scale battery projects in key areas of the state, including the 300MW Victorian Big Battery near Geelong. *(Victorian Renewable Energy Zones Development Plan Directions Paper February 2021)*

The bid to find the best and most economically feasible solution to accommodate multiple major new renewable energy projects while considering competing values, trade-offs and the Triple Bottom Line should be a major focus for transmission networks and interconnectors.

**Integrated System Plan (ISP)
for the National Electricity Market**
At a national level, the ISP is an actionable roadmap for eastern Australia's power system to optimise consumer benefits through a transition period of great complexity and uncertainty. It does so by drawing on extensive stakeholder engagement as well as internal and external industry and power system expertise. The ISP is a whole-of-system plan to maximise net market benefits and deliver low-cost, secure and reliable energy through a complex and comprehensive range of plausible energy futures. It identifies the optimal development path for the National Electricity Market (NEM), consisting of ISP projects and development opportunities, as well as necessary regulatory and market reforms. *(2020 Integrated System Plan For the National Electricity Market – AEMO)*

Victoria's Renewable Energy Action Plan defines a long-term renewable energy policy agenda and pathway. It connects a suite of initiatives that are driving investment and action in renewable energy across the state.

**The Western Victoria
Transmission Network Project (WVTNP)**
The WVTNP proposes the development of a new transmission line starting at Bulgana, near Stawell in Victoria's west, and covering approximately 190km to the north-western Melbourne suburb of Sydenham.

The WVTNP is critical infrastructure required to unlock the renewable energy potential of western Victoria as a key Renewable Energy Zone and will help to deliver clean and affordable energy to Victorians. The project will also drive economic growth and bring new job opportunities to the region.

The project will include:
- a new terminal station to the north of Ballarat
- new 220 kilovolt (kV) double circuit overhead transmission lines from the new terminal station to Bulgana (via Waubra)
- new 500kV double circuit overhead transmission lines from Sydenham to the new terminal station
- several minor upgrades, including to existing electricity infrastructure.

> The WVTNP has suffered considerable material delays due to the RIT-Ts inability to determine the vast array of Cumulative Environmental Effects and disingenuous community consultation.

2

Best Practice Route Selection and Project Design

Section 2 of this paper contains a brief discussion of the types of environmental impacts associated with transmission lines. It also includes a summary of key considerations in transmission line route selection and discusses community supported best practices for project design.

2.1 Best Practices in Route Selection

Transmission network construction is a complex engineering process. Routing a transmission line is much more difficult than routing any other public infrastructure. The current regulatory framework and process of integrated assessment used to inform decision making by all authorities (Ministers, local government, and statutory authorities) is time consuming and does not always produce satisfactory results.

Operationally, construction of a large transmission line can be completed in one or two years (depending on length), but due to complexities involved in the current approval process, and strong opposition from various groups, extensive community consultation, environmental assessments and project planning, years can be added to a project. In some cases, projects may not proceed at all.

The priority when planning transmission lines routes should be to avoid land use conflict in the first place. Considering the different characteristics of essential elements of energy transmission, an approach to transmission route design should be developed based on four primary aims:

- Use of existing Transmission Corridors or Rights-of-way (ROW)
- Avoid or minimise socio-economic impacts
- Avoid or minimise environmental impacts to protect and conserve the environment
- Ensure the Triple Bottom Line Net Economic Benefit equals the Market Benefit less costs

2.1.1 Determining the Degree of Potential Impacts

The degree of impact of a proposed energy transmission network is determined by the quality or uniqueness of the existing environment along the proposed route. The quality of the existing environment is influenced by several factors:

- **The degree of disturbance that already exists**. The significance of prior disturbance can be evaluated by determining how close the place resembles pre-settlement conditions. Many areas have been substantially altered by logging, residential and commercial developments, or conversion to agricultural and farmland
- **The threat of future disturbance**. The resource is compared to surrounding land uses that may affect the quality of the resource over time. Considerations include whether the current and likely future land uses may threaten some aspect of the resource or whether the resource is valued by the adjacent community and therefore, likely to be preserved.

2.1.2 Quantifying Potential Impacts

The construction and operation of energy transmission lines can lead to significant land use changes in the transmission rights-of-way and on the grounds of associated facilities. Many industrial, commercial, and residential uses are incompatible with the requirement to keep transmission rights-of-way clear of obstacles and structures, and for reasons of safety and public health.

The effect of a new transmission line on an area may depend on the topography, land cover, and existing land uses. In forested areas for example, the entire ROW width is cleared and maintained free of tall-growing trees for the life of the transmission line. The result is a permanent change to the ROW land cover and habitat fragmentation.

Agriculture can be affected, by the elimination of cropland, the temporary loss of crop production due to construction, and the incompatibility of certain crops and agricultural activities with transmission facilities. Transportation can be affected by the placement of transmission lines and towers near airports, roads, and waterways.

Where transmission lines are routed through areas that are valued for their scenic qualities, the visual impacts of the line (the area affected) may extend well beyond the ROW.

The priority when planning transmission lines routes should be to avoid land use conflict in the first place.

2.1.3 Mitigating Potential Impacts

The project assessment process should present design and mitigation measures that could substantially reduce and/or mitigate the likelihood, extent and/or duration of potential effects. *All design and mitigation measures must apply the mitigation hierarchy with justification of why higher order measures cannot be applied*.

- **Avoidance**: measures taken to avoid creating adverse effects on the environment from the outset, such as careful spatial or temporal placement of infrastructure or disturbance.
- **Minimisation**: measures taken to reduce the duration, intensity and extent of impacts that cannot be avoided.
- **Rehabilitation/restoration**: measures taken to improve a degraded environment following exposure to impacts that cannot be completely avoided or minimised.
- **Offsets**: measures taken to compensate for any residual, adverse impacts after full implementation of the previous three steps of the mitigation hierarchy.

The impact of the transmission route can be dealt with in different ways. Whilst it is important to understand how design ideas might be constrained by the requirements of the transmission route, it is equally helpful to consider how the requirements of the route can provoke new and innovative design, use of alternate transmission technology and layout ideas.

Responding to community supported framework, state and local planning policy will help determine if a single corridor is suitable for establishing transmission infrastructure, including the advantages of the corridor, any inherent constraints and challenges, and the relevant land use planning policies and provisions that apply.

Consideration of the cumulative environmental effects and net economic benefit as part of the Project Assessment Draft Report (PADR) can better inform the Project Assessment Conclusions Report (PACR) on the preferred and most viable corridor. Proponents can then be invited to tender, clear in the knowledge potential constraints have been considered and community opposition will be minimised.

Through alignment selection and design transmission network projects should seek to avoid or minimise environmental impacts.

2.1.4 Key Points for Consideration

- Policy context, zones, overlays, and buffers
- Agricultural values including irrigation infrastructure impacts and potential for loss of prime production agricultural land
- Potential for increased noise levels
- Potential health risks
- Impact on property values
- Landscape values and visual amenity
- Aboriginal cultural heritage and historic cultural heritage
- Bushfire ignition risk and fire-fighting constraints
- Environment, biodiversity, native vegetation, pests, and disease
- Endangered/Threatened and Protected Species
- Geotechnical and land contamination
- Social and economic assessments
- Aviation assessment
- Ease and cost of maintenance, including ongoing vegetation clearing and control of weeds, and disease
- Potential for cumulative infrastructure investment associated with the grid such as additional connecting grids and access to future renewable energy generators
- Other infrastructure requirements

Further to these considerations, the following guidance can assist in narrowing the preferred corridor to a final route.

- Apply planning policy setback distances from zones, overlays, and buffers
- Maximise distance from residences and township settlement boundaries
- Maximise distance from National Parks, State Parks and Conservation Reserves
- Avoid Highest-Risk bushfire zones and Bushfire Management Overlays (BMOs)
- Minimise multiple crossings of highways in short distances
- Minimise repeated crossings of waterway
- Minimise native vegetation clearing
- Avoid terrain that makes construction and maintenance of a transmission line more difficult
- Attempt to cross farmland and cropland at narrow areas where it can be spanned, or the number of structures minimised
- Maximise distance from radio towers, other communication-related facilities, and wind turbines
- Maximise distance from or identify opportunities to span known aboriginal cultural heritage and historic cultural heritage sites.

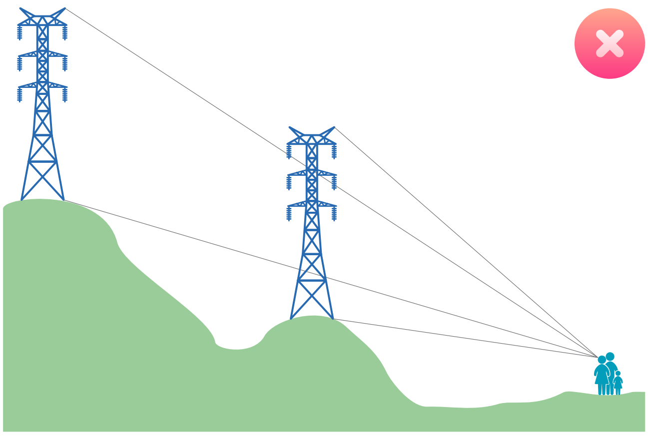
2.1.5 Topography

The selection of any new electricity transmission line route will be a balance of all the various factors or constraints which must be taken into account. Any overhead transmission line will be a visual intrusion into the landscape through which it passes, and it is the dominant scale of towers which makes them difficult to absorb into the landscape. In selecting a route, network operators should seek to reduce the visual effect of the line in terms of the number of people affected and the degree to which they are affected. The nature and topography of the landscape must be considered, and any statutory protection afforded to an area should also be considered. An understanding of the effect of topography will help to establish which towers may be more prominent and will help to inform site layout and design decisions to reduce visual impacts.

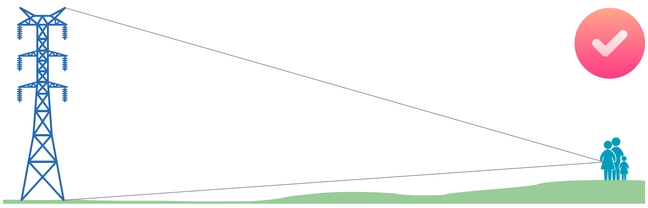
The selected route should typically seek to avoid crossing the highest contours, where towers would generally be the most prominent and should take account of the quality of the landscape and its ability to accommodate an overhead line. In other words, an overhead line should 'fit' into the landscape as much as that landscape permits. The topography of a development site can affect the perception of towers and high voltage overhead lines and is an important design consideration. Even subtle changes in topography can affect our perceptions of towers.

Where towers are set in an elevated position and are viewed from lower ground, the scale and visual impact of the towers is emphasised. Conversely, where towers are viewed from an elevated position the visual impact is much reduced.

(UK National Grid - A Sense of Place - Design guidelines for development near high voltage lines: page 39)



As well as the position of the viewer, the perception of the visual impact of the towers is also affected by their relationship relative to the viewer's horizon. Towers set across the brow of a hill will be silhouetted against the sky and will appear more prominent. It is important to avoid steep, visually prominent hillsides with dramatic shifts in typography when siting overhead transmission infrastructure.



Flat or slight to moderate undulating open topography, well away from neighbours and towns reduces visual impact and represents a more acceptable option when siting overhead transmission infrastructure.

2.2 Best Practices in Project Design

2.2.1 Rights-of-way and Transmission Options
Route selection should try to avoid, minimise, or offset impacts on important environmental, social, cultural and landscape values and avoid community and land use conflict by utilising existing rights-of-way and undergrounding as a preferred transmission option. Feasibility of the preferred route should be determined early using desktop analysis using the following strategies.

2.2.2 Detailed Environmental Mapping - GIS Solutions
Balancing the need to develop new markets, improve system reliability, and reduce operation costs is the greatest challenge for today's energy network decision makers—a challenge that is successfully met with geographic information system (GIS) software. GIS should be used early in the project assessment process (prior to tender) for planning energy transmission networks. Sophisticated spatial analysis will provide a clear understanding of the most appropriate route to avoid or minimise environmental impacts.

2.2.3 Replacing or Upgrading Existing Lines
One method to mitigate impacts during project design is replacing or increasing the capacity of an existing line rather than building a new line. The environmental advantages of double-circuiting an existing line are:

- Little or no additional ROW clearing, if the new line can be placed in the centre of an existing ROW
- Land use patterns may have already adapted to the existing ROW
- Magnetic fields may be reduced because new structure designs place line conductors closer together resulting in lower fields.

2.2.4 Use of Existing Right-of-Way
Every effort should be made to site new transmission lines, to the greatest extent feasible that is consistent with economic and engineering considerations, reliability of electric system, and protection of the existing environment, utilising corridors in the following order of priority:

1. Existing utility corridors
2. Highway and railroad corridors
3. New corridors.

When rigorously evaluated as part of routing decisions, corridor sharing can be a useful method in mitigating environmental, property, and community impacts of a new transmission line.

2.2.5 Construction of New Right-of-Way for Overhead Transmission
When use of existing corridors and easements is not feasible, alternative routing must be proposed for transmission rights-of-way, as well as alternative locations for substations and other transmission facilities.

Construction of new rights-of-way for overhead transmission will require extensive stakeholder engagement and the likelihood the project will be referred through the EES process. Due to strong opposition from various groups, complexities of the environmental assessment process and increased need for project planning, years can be added to a project. In some cases, these complexities result in projects not proceeding at all.

2.2.6 Construction of New Right-of-Way for Underground Transmission
Construction of new rights-of-way for underground transmission will be more widely accepted by community as while the initial environmental impact may be greater in some areas, the impact is only temporary with remediation.

2.2.7 Underground Transmission using High Voltage Direct Current (HVDC)
Integration of HVDC into existing networks provides a range of additional advantages such as improving the stability and resilience of the existing power networks and facilitating the integration of renewable energy. Undergrounding can use existing easements and rights-of-way to minimise environment and community impact. This expedites project delivery as community opposition will be negligible.

While High Voltage Active Current (HVAC) is feasible for overhead power transmission, it is not technically feasible to put HVAC underground for more than 35 – 70 km. This limitation does not exist with HVDC underground, allowing for the efficient transfer of electricity over much longer distances. Undergrounding HVDC reduces impacts by:

- Eliminating the risk of infrastructure damage, costly power outages and disruption to communities from extreme weather events
- Eliminating risk of fire ignition and to fire-fighting activities
- Minimising restrictions on landowners whose properties are subject to easements
- Avoiding impact on property values
- Avoiding impact visual or landscape amenity

3

Community Supported Impact Mitigation

Section 3 of this paper discusses widely-accepted and community-guided approaches and best practices for assessing and mitigating impacts associated with the routing, siting, construction, and operation of high-voltage energy transmission and associated facilities.

3. Protecting Victoria's Environment – Biodiversity 2037

Protecting Victoria's Environment – Biodiversity 2037 is Victoria's plan to stop the decline of our native plants and animals and improve our natural environment. Biodiversity is all components of the living world: the number and variety of native plants, animals and other living things across our land, rivers, coast, and ocean. You may think of it simply as nature.

Victoria's natural environment is richly diverse, unique and precious.

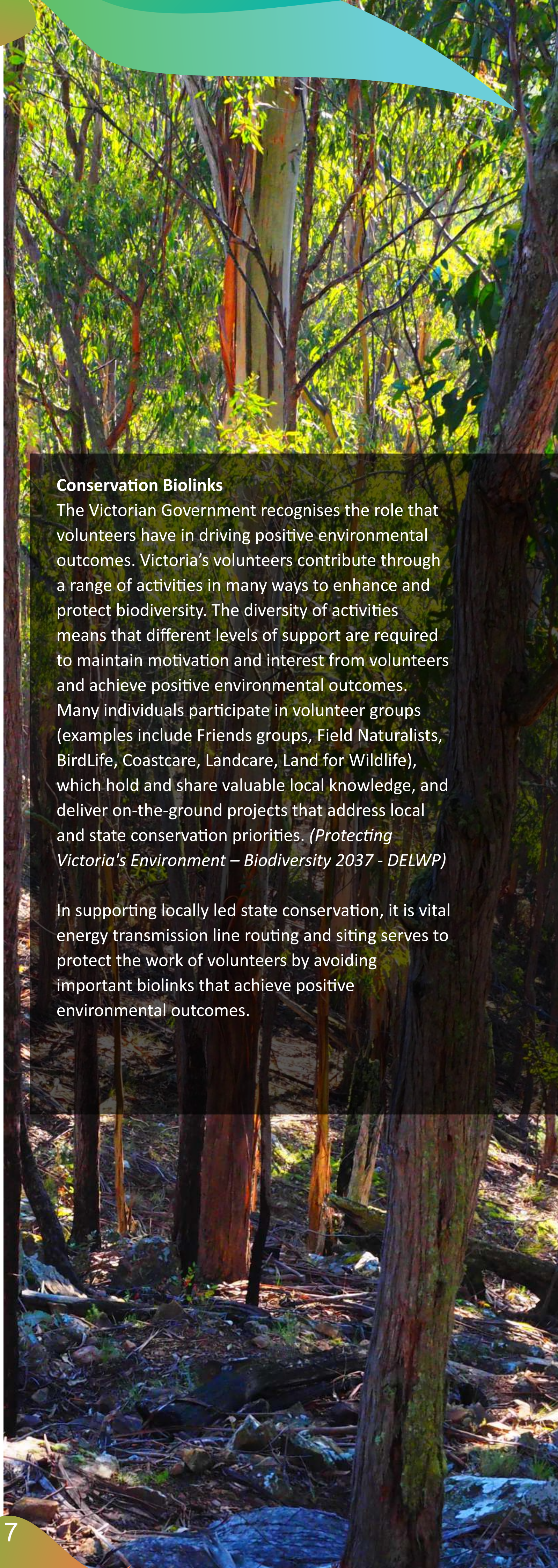
Launched in 2017, Protecting Victoria's Environment – Biodiversity 2037 presents a long-term vision for Victoria's biodiversity supported by two overarching goals:

- Victorians value nature, and
- Victoria's natural environment is healthy.

Despite understanding the importance of our natural environment, not enough has been done to protect it from harm. Victoria's biodiversity is in decline. More than half of the state's native vegetation has been cleared since European settlement, and many native plant and animal species are at risk from a range of pressures, including the impacts of climate change.

The decline of our biodiversity also impacts the future health, well-being and prosperity of all Victorian communities. *(Protecting Victoria's Environment – Biodiversity 2037 - DELWP)*

In protecting Victoria's environment, it is vital energy transmission line routing and siting serves to protect and enhance our natural environment by avoiding sensitive areas and further decline of our biodiversity.



Conservation Biolinks

The Victorian Government recognises the role that volunteers have in driving positive environmental outcomes. Victoria's volunteers contribute through a range of activities in many ways to enhance and protect biodiversity. The diversity of activities means that different levels of support are required to maintain motivation and interest from volunteers and achieve positive environmental outcomes. Many individuals participate in volunteer groups (examples include Friends groups, Field Naturalists, BirdLife, Coastcare, Landcare, Land for Wildlife), which hold and share valuable local knowledge, and deliver on-the-ground projects that address local and state conservation priorities. *(Protecting Victoria's Environment – Biodiversity 2037 - DELWP)*

In supporting locally led state conservation, it is vital energy transmission line routing and siting serves to protect the work of volunteers by avoiding important biolinks that achieve positive environmental outcomes.

3.1 Biodiversity and Habitat

Our natural environment is not only beautiful, it is fundamental to the health and well-being of every Victorian. It provides clean air and water, productive soils, natural pest control, pollination, flood mitigation and carbon sequestration – and supports productive activities that underpin our state's liveability and economic advantage. *(The Hon. Lily D'Ambrosio MP, Protecting Victoria's Environment – Biodiversity 2037 - DELWP)*

The construction and operation of transmission lines can affect biodiversity in many ways, including habitat conversion and fragmentation, changes in hydrology, soil compaction and erosion, pesticide use, introduced species, and hunting and harvesting enabled by rights-of-way and construction roads. Species in small, rare, sensitive, and otherwise critical habitats may be especially affected.

The impact on wildlife from transmission line construction and operation include bird electrocutions and collisions, changes in predator-prey relations in and along the edges of rights-of-way, destruction or alteration of wetland and aquatic environments, and increases in hunting and fishing enabled by rights-of-way and construction/maintenance roads.

Several types of habitat should be avoided during the siting of transmission lines for both engineering and environmental reasons. Habitat critical to the survival of a species on a local or regional basis, habitat with endangered or threatened species, and habitat known to be particularly productive are to be avoided wherever possible.

The best way to avoid negative effects on wildlife habitat is to avoid sensitive sites. Early, detailed planning should determine a route which has the least possible negative effect, and the most potential benefits.

The objective is to avoid, and where avoidance is not possible, minimise potential adverse effects on protected native vegetation and animals, as well as address offset requirements consistent with state and Commonwealth policies

3.1.1 Habitat Fragmentation

Victoria is the most intensively settled and cleared state in Australia. This has enabled Victoria to become a powerhouse of agricultural production, with huge benefits to the state economy. But it has also left a legacy of loss, degradation and fragmentation of habitats that is evident across the state. The effects of this legacy will continue, creating more pressure on species and increasing their vulnerability to other threats. Although the rate of land clearing has slowed since the introduction of Victoria's native vegetation regulations in 1989, the quality and extent of native vegetation continues to shrink by about 4000 habitat hectares each year. This trajectory is largely the result of activities and entitled uses that are outside the regulatory framework (resulting in loss of extent of native vegetation), together with insufficient management of threats (resulting in loss of quality). *(Protecting Victoria's Environment – Biodiversity 2037 - DELWP)*

The objective of transmission route planning should be to avoid habitat fragmentation in all activities. Recommended measures to prevent and control impacts to native habitats during construction of the right-of-way include:

- Site transmission rights-of-way, access roads, lines, towers, and substations to avoid critical habitat through use of existing utility and transport corridors for transmission, and existing roads and tracks for access roads, whenever possible.

3.1.2 Invasive Plants

Human actions are the primary means of invasive species introductions. Transmission line construction causes disturbance of ROW soils and vegetation through the movement of people and vehicles along the ROW, access roads, and laydown areas. These activities can contribute to the spread of invasive species. Parts of plants, seeds, and root stocks can contaminate construction equipment and essentially "seed" invasive species wherever the vehicle travels. Infestation of invasive species can also occur during periodic transmission ROW maintenance activities especially if these activities include mowing and clearing of vegetation. Once introduced, invasive species will likely spread and impact adjacent properties with the appropriate habitat.

The objective should be avoidance of invasives to minimise their spread.

3.1.3 Disease

Phytophthora Cinnamomi (Cinnamon Fungus) is a microscopic, soil-borne disease-causing organism that attacks and destroys plant root systems causing plants to die through lack of water and nutrients. Patches of dead or dying vegetation can indicate the presence of this silent killer and grass trees are particularly susceptible. The disease spreads naturally but is accelerated though the transport of infected soil and gravel by road-making machinery and other vehicles.

Cinnamon Fungus is listed in the top 100 of the world's most invasive species and is Victoria's most significant plant pathogen affecting both native ecosystems and the horticultural industry. The presence of Cinnamon Fungus threatens not only vegetation communities – it can alter the ecology of entire ecosystems.

Birds, insects, reptiles and mammals that depend on the original plant species for their survival also decline in numbers as shelter and food sources disappear.

Quarantine and vehicle hygiene to limit the spread of the disease can only be achieved through an up-to-date knowledge of its distribution and by restricting access to uninfected sites.

3.1.4 Avian and Bat Collisions and Electrocutions

The combination of the height of transmission towers and the electricity carried by transmission lines can pose potentially fatal risk to birds and bats through collisions and electrocutions. Avian collisions with power lines can occur in large numbers if located within daily flyways or migration corridors, or if groups are travelling at night or during low light conditions (e.g. dense fog). In addition, bird and bat collisions with power lines may result in power outages and fires.

Recommended prevention and control measures to minimise avian and bat collisions and electrocutions include:

- Installation of underground transmission lines in sensitive areas (e.g., critical native habitats)
- Bird collisions can be avoided by siting of towers and lines away from avian flyways, based on environmental surveys
- Aligning transmission corridors to avoid critical habitats (e.g., nesting grounds, heronries, rookeries, bat foraging corridors, and migration corridors)

3.1.5 Fauna, Endangered, Threatened and Protected Species

Conservation management is shifting away from focusing solely on the most endangered species. Focusing only on the 'emergency end' of biodiversity decline is unlikely to be the most effective way of preventing extinctions over the long term, because the necessary management actions are typically high risk and high cost. Instead, the focus is more on how ecosystems and ecological processes can be managed for the benefit of all species, particularly given the impacts of climate change. This means re-balancing efforts and investment to increase the focus on prevention, as well as the critical care of biodiversity. *(Protecting Victoria's Environment – Biodiversity 2037 - DELWP)*

Endangered species are species whose continued existence is in jeopardy. Threatened species are likely to become endangered. Construction and maintenance of transmission lines may destroy individual plants and animals or alter their habitat so that it becomes unsuitable for them. For example, trees used by rare birds for nesting might be cut down or soil erosion may degrade rivers and wetlands that provide required habitat.

If endangered, threatened or protected species is likely to be in the project area, or the transmission network poses a threat to native fauna, impacts should be avoided by modifying the route, changing the design of the transmission line, reducing the workspace at a particular location, employing special construction techniques, or limiting construction activities to specific seasons.

3.2 Cultural Heritage

Culture and heritage sites are protected resources. They are important and increasingly rare tools for learning about the past. They may also have religious significance.

Transmission line construction and maintenance can damage sites by digging, crushing artifacts with heavy equipment, uprooting trees, exposing sites to erosion or the elements, or by making the sites more accessible to vandals. Impacts can occur wherever soils will be disturbed, at pole locations, or where heavy equipment is used.

The objective is to avoid, or minimise where avoidance is not possible, adverse effects on Aboriginal cultural heritage and historic heritage values.

3.3 Landscape and Visual

3.3.1 National Parks, State Parks and Conservation Reserves

The siting of transmission facilities must seek to avoid to the maximum extent possible areas of high ecological, cultural, economic, and aesthetic value and sensitivity.

The objective is to protect and maintain the natural, aesthetic and scientific values of significant geological and geomorphological features.

Overhead transmission infrastructure should not permanently alter character of state significant landscape. When the construction of transmission facilities in or near sensitive habitats cannot be avoided, impacts should be minimised using underground cables instead of overhead lines.

3.3.2 Prioritising the Public Realm

The first priority should be on promoting the environmental quality and diminishing the impact of towers on the public realm.

Most people will experience a place from the public realm: that is streets, squares and parks. Local residents, workers and visitors all use the public realm in one way or another, and will all base their perceptions of the environmental quality of a place and notions of civic pride on its environmental qualities.

It therefore follows that where the overhead line impacts upon the public realm, the potential visual impact of that overhead line would be experienced by more people and would impact more severely on the perception of environmental quality than, for example, if the impact was solely on private areas or situated well away from materially populated townships. Therefore, in promoting a sense of place, the first priority should be on promoting the environmental quality and diminishing the impact of towers on the public realm.

(UK National Grid - A Sense of Place - Design guidelines for development near high voltage lines: page 34)

3.3.3 Visual Amenity

The overall sensitivity of a particular viewing location or area to change in the visual environment is an important factor in undertaking an assessment of the Project's potential visual impact. A viewing location with a higher level of sensitivity, such as a residential dwelling, would be more susceptible to visual impacts than a viewing location with a lower sensitivity, such as an industrial property.

Overhead transmission infrastructure is not compatible with scenic, rural, agricultural landscapes or residential neighbourhoods. Many landowners find transmission lines within or bordering their property particularly disruptive to scenic views.

Visual impacts depend on:

- The physical relationship of the viewer and the transmission line (distance and sight line)
- The activity of the viewer (e.g., living in the area, driving through, or sightseeing)
- The contrast between the transmission structures and the surrounding environment, such as whether the line stands out or blends in.

A transmission line can impact visual amenity by:

- Permanently degrading the surrounding environment (e.g., intruding on the view of a landscape)
- Changing the context of the viewshed (e.g., evoking an image of development in a previously rural area).

To avoid or mitigate the visual impact of transmission projects, the following measures should be implemented:

- Genuine community consultation during the planning of the transmission line route
- Undergrounding transmission lines where they must be routed through, or close to, materially populated residential areas, or significant landscape
- Accurate assessment of changes in property values due to transmission line proximity
- Siting transmission lines, and designing substations, with due consideration to landscape views and important environmental and community features
- Location of high-voltage transmission and distribution lines in less populated areas, where possible.

3.4 Land Use and Socio-economic

3.4.1 Land Use Changes

The priority when planning land use and development is avoiding land use conflict in the first place. This involves understanding where existing industry and other uses with potential off-site impacts are and ensuring current zoning appropriately protects operators and surrounding communities. It also means making sure that sensitive uses and future urban growth are directed away from areas that could be affected by off-site impacts. Strategic planning around uses with potential off-site impacts should consider the capacity or need for future expansion of that use or expected changes to operations.

(Managing buffers for land use compatibility - Planning Practice Note 92 - Planning Victoria - page 2)

In some jurisdictions, planning permits are not required for transmission and other associated infrastructure to connect a wind farm to the grid. This lack of review and oversight can lead to a wide range of community issues related to the design, routing and installation of the transmission line and related assets. The prospect also exists for duplicative assets connecting each wind or solar farm to the grid, with no mandatory requirement to seek consolidation of such assets to minimise community impact and promote a more efficient use of capital.

Transmission lines, substations and other related electrical infrastructure should all be subject to and require an appropriate and detailed planning permit, ideally as part of the overall permit for the project. Careful consideration should be given to the design and routing of the transmission line. Proponents should collaborate wherever possible to optimise use of shared transmission facilities. Relevant governance bodies (transmission planning, electrical safety, road safety, local councils etc.) should be properly consulted on the project and exercise their oversight responsibilities accordingly.

(Office of the National Wind Farm Commissioner Annual Report to the Parliament of Australia 2019: 4.1 - page 40)

Victoria Planning Provisions (VPP)
Amendment number VC157. Gazettal date 15 March 2019.
Amendment VC157 introduces changes to the Victoria Planning Provisions (VPP) and all planning schemes to require planning approval for power lines to connect new large-scale electricity generation facilities to the electricity network.

3.4.2 Agricultural Land

Overhead transmission infrastructure impacts agricultural and farming operations in many ways:

- Create problems for turning some field machinery and maintaining efficient fieldwork patterns
- Increase soil erosion by requiring the removal of windbreaks that were planted along field edges or between fields
- Create opportunities for weed and another pest encroachment
- Compact soils and damage drain tiles
- Result in safety hazards due to tower and line placement
- Hinder or prevent aerial spraying or seeding activities by planes or helicopters
- Interfere with moving irrigation equipment
- Hinder future consolidation of farm fields or subdividing land for residential development.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly impact future crop yields.

Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

The objective should be to avoid routing transmission lines through productive agricultural land. The strategic purpose of Farming Zones is primarily concerned with keeping land in agricultural production and avoiding land uses that could limit future farming or constrain agricultural activities. In this zone:

- Uses that could lead to the loss or fragmentation of productive agricultural land, or which could be adversely affected by farming activities, **are prohibited**.

(Planning for Melbourne's Green Wedges and Agricultural Land Consultation Paper - DELWP 2020)

3.4.3 Township Settlement Boundaries

Consideration should be given to setback distances between new energy transmission infrastructure and a materially populated township settlement or city boundary. A minimum setback distance will serve to preserve amenity of established residential areas, protect amenity of significant landscape and provide flexibility for future growth of the township.

3.4.4 Rural Conservation Zone

The Rural Conservation Zone is primarily concerned with protecting and conserving rural land for its environmental features or attributes. The conservation values of the land must be identified in the schedule to the zone and could be historic, archaeological, landscape, ecological, cultural or scientific values. In this zone:

- Land use and development is controlled in the zone to safeguard the natural environment and conserve the identified environmental qualities of the land.

(Planning for Melbourne's Green Wedges and Agricultural Land Consultation Paper - DELWP 2020)

3.4.5 Rural Living Zone

This zone provides for residential use in a rural environment. It is designed to cater for lots in a rural setting that are large enough to accommodate a dwelling and a farming use. In this zone:

- Residents have a reasonable expectation that their amenity will be protected from potentially incompatible land uses

(Planning for Melbourne's Green Wedges and Agricultural Land Consultation Paper - DELWP 2020)

In general, transmission lines are routed through less populated areas. In materially populated areas, transmission line projects face higher reluctance due to aesthetic, health hazards, and other reasons. Materially populated areas must be avoided. When there is no alternative or alternatives are not technically feasible, then undergrounding represents an option universally accepted by communities.

3.4.6 Tourism and Recreation

Landscapes are significant to different people for different reasons. The reasons vary from being admired for their scenic beauty, to historic value, recreation, mental health, environmental qualities, the value to the regional economy and other less tangible values associated with the place, such as memories or associations.

Recreation areas include parks, trails, lakes, or other areas where recreational activities occur. Overhead transmission infrastructure can impact tourism and recreational areas by:

- Permanently altering public viewpoints
- Permanently altering landscape character and prominent features of the surrounding landscape
- Discouraging potential users of recreational areas whose activities depend on the aesthetics of natural surroundings (bushwalkers, trail runners, hikers)

The objective of overhead transmission line routeing should be to avoid socio-economic disbenefits on tourism hubs and recreational areas. Undergrounding is the preferred mitigation approach.

3.5 Community Safety

3.5.1 Bushfire Ignition Risk and Fire-fighting Constraints

Overhead transmission infrastructure amplifies the risk to fire ignition and fire-fighting. Fires burning near or beneath transmission lines are hard to control and have potential to endanger habitat, fauna, community and homes.

Two primary objectives of the Code of Practice for Bushfire Management are:

- To minimise the impact of major bushfires on human life, communities, essential and community infrastructure, industries, the economy and the environment. Human life will be afforded priority over all other considerations.
- To maintain or improve the resilience of natural ecosystems and their ability to deliver services such as biodiversity, water, carbon storage and forest products.

In achieving these objectives, overhead transmission infrastructure should be:

- Installed underground to mitigate risks to life, property, and the environment.
- Routed away from Bushfire Management Overlays (BMOs)
- Routed away from High-Risk Bushfire prone areas
- Routed away from materially populated residential areas designated as high risk by Forest Fire Management Victoria

(Forest Fire Management Victoria - East Grampians Region)
(Code of Practice for Bushfire Management on Public Land)
(Grampians Bushfire Management Strategy 2020)

3.5.2 Aircraft Navigation Safety

Overhead transmission infrastructure, located near an airport or known flight paths, can impact aircraft safety directly through collision or indirectly through navigation interference.

Aircraft collision impacts should be mitigated by:

- Use of underground cables when installation is required in flight sensitive areas
- Avoiding the siting of overhead transmission infrastructure close to airports and outside of known flight path envelopes
- Avoiding the siting of overhead transmission infrastructure close to private airstrips on agricultural and farming land
- Avoiding impact on aerial spraying practices on agricultural and farming land
- Avoiding the siting of overhead transmission infrastructure across or near bodies of water utilised as a fire-fighting asset
- Avoid siting overhead transmission infrastructure in known flight paths or near landing areas used for aerial search and rescue operations.

3.5.3 Mental Health

It is important to consider community concerns of the potential impacts an energy transmission project will have on lifestyle and mental health. Uncertainty surrounding proposed corridors, multiple alternate options, poor community consultation and lack of social license has a profound mental health and physiological impact on members of an effected community. The undue stress and anxiety experienced by members of the community often demonstrates a clear lack of understanding and concern about the cumulative environmental impacts.

The recent *Royal Commission into Victoria's Mental Health System identifies that* Prevention and mental health promotion are important strategies to improve mental well-being and reduce mental illness. ‘Primary prevention’ describes policies, initiatives or activities which try to prevent the initial occurrence of mental illness or psychological distress. It is achieved by reducing the risk factors associated with mental illness and strengthening protective factors.

Reducing the risk factors can be achieved by enhancing the regulatory framework and allowing community to influence the selection of the preferred transmission route.

3.6 Catchment Values and Hydrology

3.6.1 Hydrologic Changes

Transmission line construction can alter hydrology by compacting soil, removing plant cover, and altering existing drainages or creating new ones. Altered hydrology can affect aquatic, wetland, and riparian habitats and species, and can affect soil moisture and surface water availability in other kinds of ecosystems.

3.6.2 Aquatic Habitat Alteration

Power transmission and distribution lines, and associated access roads and facilities, may require construction of corridors crossing aquatic habitats that may disrupt watercourses and wetlands, and require the removal of riparian vegetation. In addition, sediment and erosion from construction activities and storm water runoff may increase turbidity of surface watercourses.

Recommended measures to prevent and control impacts to aquatic habitats include:

- Locating transmission towers and substations to avoid critical aquatic habitat (e.g., watercourses, wetlands, and riparian areas), as well as fish spawning habitat, and critical fish over-wintering habitat
- Maintaining fish access when road crossings of watercourses are unavoidable by utilising clear span bridges, open-bottom culverts, or other approved methods
- Minimising clearing and disruption to riparian vegetation.

3.6.3 Earthworks and dust management

An energy transmission network can occupy a large area and can reshape the topography through extensive grading and other land disturbance processes, changing the way water flows over land and potentially contributing to altered flood flows or creating erosion. Soil removed by erosion may become airborne as dust or be carried into waterways, causing pollution.

Works should be planned to minimise changes to the topography of the site caused by grading or other ground works, to avoid significant changes to the overland flow of water and visual impacts on the landscape.

3.6.4 Potential Impacts to Surface Waters

Waterways in the form of creeks, streams, rivers, and lakes are abundant throughout Victoria. Many of these waters have been designated as special resources that have state, regional, or national significance. Construction and operation of a transmission line across these resources may have both short-term and long-term effects. The type and significance of the impact is dependent on the characteristics of the water resource and the transmission line design. Waterway use, physical features such as channel width, herbaceous plant cover, and water quality, recreational use, and the scenic quality of the river and its surrounding landscape are important factors in assessing potential impacts.

Water quality can be impacted not only by work within a waterway but also by nearby vegetation clearing and construction activities. The removal of adjacent vegetation can cause water temperatures to rise and negatively affect aquatic habitats. It can also reduce trickle filtration effects and increase erosion of adjacent soils causing sediment to be deposited into the water body, especially during rain events.

Construction often requires the building of temporary bridges that, if improperly installed may damage banks and cause erosion or be overtopped or dislodged, and back up water. Overhead transmission lines across major rivers, streams, or lakes may have a visual impact for river users and pose a potential collision hazard for waterfowl and other large birds, especially when located in a migratory corridor. Recreational use such as sight-seeing, boating, fishing, or bird watching could be adversely affected.

Impacts to waterways can be avoided by routing the line away from the waterway, adjusting tower placements to span the resource overhead or constructing the line under the resource. Methods to minimise impacts include avoiding tower placements adjacent to the resource, using approved erosion control methods.

3.6.5 Toxic and Water Pollution

Toxic pollution from transmission structures can result from pesticide use in rights-of-way, and from the leakage of PCBs from equipment that contains them. Water pollution can result from inadequate wastewater treatment for construction camps, workshops, and staff quarters.

3.6.6 Wetland and Riparian Impacts

Transmission line construction and maintenance can convert areas of wetland or riparian ecosystem, destroy or disturb plant and animal communities, and introduce invasive species. Soil compaction and soil erosion in wetlands and riparian areas can alter hydrology, changing the timing and magnitude of water and nutrient flows essential to ecosystem functions.

Wetlands occur in many different forms and serve vital functions including storing runoff, regenerating groundwater, filtering sediments and pollutants, and providing habitat for aquatic species and wildlife. The construction and maintenance of transmission lines can damage wetlands in several ways including the following:

- Heavy machinery can crush wetland vegetation
- Wetland soils, especially very peaty soils can be easily compacted, increasing runoff, blocking flows, and greatly reducing the wetland's water holding capacity
- The construction of access roads can change the quantity or direction of water flow, causing permanent damage to wetland soils and vegetation
- Construction and maintenance equipment that crosses wetlands can stir up sediments and endanger fish and other aquatic life
- Transmission lines create collision obstacles for waterfowl, and other large water birds
- Clearing forested wetlands changes the habitat type for decades, and can expose the wetland to invasive and shrubby plants, thus removing habitat for species in the forest interior
- Vehicles and construction equipment can introduce exotic plant species and invasive microbial pests that may out-compete high-quality native vegetation and/or destroy flora and fauna habitats.

Any of these and other activities can impair or limit wetland functions. Organic soils consist of layers of decomposed plant material that formed very slowly. Disturbed wetland soils are not easily repaired. Severe soil disturbances may permanently alter wetland hydrology.

The objective should be to avoid potential impacts to wetlands by routing transmission lines away from wetlands.

3.6.7 Flooding

Energy transmission infrastructure should not increase flood risks on the site or in the immediate area. Flood risks (unlike most other natural hazards) are predictable in terms of their location, depth and extent.

Works should be planned to implement measures to reduce flood damage, including:

- Minimising grading or levelling of the site, to avoid changes to overland water flow and discharge patterns
- Avoiding locations within the immediate floodplain or a watercourse or river system
- Elevating structures above the floodplain as recommended by the relevant Facility Management Authority (FMA).

DELWP has information about where flooding occurs and the systems in place to manage them. Proponents should contact the relevant FMA to obtain site-specific advice to inform the planning permit process.

3.6.8 Soil Erosion

Transmission line construction can lead to soil erosion by removing vegetation cover, compacting soils, and cutting into banks. Erosion can reduce soil fertility and lead to siltation, which affects water quality and productivity in aquatic and wetland ecosystems.

4

Social License and Prudent Avoidance

Section 4 of this paper discusses the importance of early community involvement and informs on the benefits of working to acquire and maintain social license. This section also contains a summary of internationally-guided 'Prudent Avoidance' practices for siting energy transmission infrastructure.

4.1 Social License to Operate

The notion of a social licence to operate has become widely accepted by developers and community members, particularly in recent years. While a social licence is intangible, its practical, financial, and even legal implications are significant. The recommendations of this discussion paper offer a powerful tool to assist proponents in better understanding community perceptions of and expectations for engagement, thereby reducing project risk and improving the likelihood of mutually beneficial outcomes.

The social licence to operate is not something that, once earned, is fixed and unchanging. It varies over time in response to changes in the community and developers' behaviour. Different parts of a community might display different levels of acceptance to transmission route options. The social licence is therefore something that must be earned then renewed every day; it is a goal towards which the industry must constantly strive. The social licence helps to understand public sentiment toward energy transmission networks and guides actions that garner community acceptance and approval. It is therefore underpinned by the assumption that only genuine dialogue and willingness to understand and negotiate community expectations will enable successful network development in the long-term.

The social license to operate is made up of three components: legitimacy, credibility, and trust.

- **Legitimacy**: this is the extent to which an individual or organisation plays by the 'rules of the game'. That is, the norms of the community, be they legal, social, cultural, formal or informal in nature.
- **Credibility**: this is the individual or company's capacity to provide true and clear information to the community and fulfil any commitments made.
- **Trust**: this is the willingness to be vulnerable to the actions of another. It is a very high quality of relationship and takes time and effort to create.

Transmission companies, energy regulators, market operators, relevant peak bodies and government need to partner with community in every aspect of planning, development and decision making, including the development of alternatives and the identification of a preferred solution. Community engagement is key to the success of any major infrastructure project and is most successful when it establishes and delivers on clear expectations and gives people the opportunity to influence decisions.

To meet future growth, well informed community stakeholders should be able to self-nominate to actively participate in the decision-making process and be involved in drafting plans for energy transmission networks. This will help reduce land use conflicts by:

- Identifying potential transmission corridors and substation sites using existing rights-of-way
- Identifying areas where undergrounding is essential and overhead transmission is acceptable
- Defining setbacks from materially populated township settlement boundaries, habitable dwellings, zones, overlays, buffers and strategic agricultural/fam land.

Community engagement is most effective in developing constructive relationships and trust if it starts during the projects inception. Having routing and siting decisions guided by community through a more consistent rationale is by far the greatest benefit, particularly when considering potential environmental, socio-economic, legal and legislative consequences. Community supported framework will produce more consistent, defensible, and transparent energy transmission route decisions.

Building long-term relationships and trust with communities, is key to energy network development in Australia.

4.2 International Prudent Avoidance Practice

Many Countries have defined setback requirements for high voltage power lines (e.g. Great Britain, Finland, Switzerland, Israel). These restrictions are varied and complex.

The World Health Organization recommends that countries adopt the guidelines established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) or the International Committee on Electromagnetic Safety (ICES).

The World Health Organisation has established a Model Legislation for EMF Protection which could be utilised to develop/expand Australian regulations in line with international guidelines.

Although there are a number of countries without a formal policy in this area, many countries and jurisdictions have formally or informally applied some international guidelines (either ICNIRP's standards or the European Union's (EU) 1999/518/EC), by adopting the Precautionary Principle or Prudent Avoidance practices. In line with these guidelines, some countries, or jurisdictions have chosen to apply strict policies based either on setback distances or by setting maximum EMF limits allowed at the edge of the transmission easements or by avoiding these risks by utilising different technology (e.g. undergrounding).

USA

Although there is not a formal EMF protection Policy for the USA, the US Department of Housing and Urban Development requires a setback distance to be not less than the 2.5 times the height of the tower. Other jurisdictions within USA have different controls.

California has specific guidelines on how close residences, schools, etc., can be built to overhead power line easements.

Iowa's Code Chapter 478 places restriction on the distance of new transmission lines from any home or business.

The Connecticut Public Act 04-246 restricts the siting of overhead transmission lines (345 kV or greater) adjacent to residential areas, private/public schools, childcare facilities, youth camps or playgrounds, unless the applicant can demonstrate that undergrounding will be technically infeasible or may result in an unreasonable economic burden on the ratepayers of the state.

In Washington State, there are Prudent Avoidance municipal regulations for electrical transmission and distribution facilities which include a preference for undergrounding these facilities.

In Colorado, no public utility may construct facilities within the territorial boundaries of a city or county unless the utility complies with the applicable zoning requirements including, "all electrical transmission lines shall be installed underground in all zones except the manufacturing district and light industrial / country technology district, unless the city council finds that exposure to electrical magnetic fields and adverse impact to land value and aesthetics can be reasonably mitigated by Prudent Avoidance measures. Use of overhead power should consider, among other factors, facility size, location, setback, topography, scheduling, cost, sensitive lands, land value and proximity to children and schools".

Austria

While the national government of Austria follows the 1999 EU Recommendations, the district of Salzburg introduced additional restrictions that would require undergrounding. For systems with voltage greater than 110 kV that in the future will be installed in sensitive areas, they should be buried where technically and economically efficient to do so. Sensitive areas are defined by distance, as follows: 400m between an overhead line and land in the zoning code that falls under categories in the Regional Planning Act of 2009 *(specifics not indicated and translation not available)*; and 200m between an overhead line and individual use building in permanent residential use in categories in the Regional Planning Act of 2009 *(specifics not indicated and translation not available)*.

Bulgaria

In 1991 the Bulgarian government issued a national ordinance establishing maximum permissible exposures for electromagnetic radiation in residential areas and determined safety zones around electromagnetic sources. The ordinance is available through the WHO's EMF standards database; however, the document uploaded is in Bulgarian. Another source indicates that the Bulgarian government established minimal distances between residences and power lines or substations. Although they indicate the minimal distances are based on voltage, they do not specify what those distances are.

Denmark

The Danish National Board of Health recommended in 1993, and reaffirmed in 2007, that homes or places where children spend time should not be constructed near to transmission lines and vice versa. The Board, however, did not specify minimum distances and left it to “pragmatic considerations.”

In 2008, Denmark was among the first to mandate routing power underground, despite the added expense. Requiring most new AC and HVDC transmission to be routed underground.

Germany

Although setback values have not been defined, German Law now stipulates that underground cables are the standard for new high voltage direct current (HVDC) projects while overhead lines have become an exception. Further, overhead lines close to residential areas in general, have been disallowed.

Undergrounding of cables is expected to ease grid expansion delays as buried cables are associated with less intrusion and environmental impact. In 2015, Germany mandated underground transmission for HVDC systems.

Australia

As part of its Prudent Avoidance practices, it is recommended Australia (similar to other progressive countries and jurisdictions), consider undergrounding of transmission cables as world best practice and the preferred energy transmission standard. Proponents would be required to validate the safety and environmental impacts of any alternative approach. Setback distances may no longer be required as underground cable easement distances alone should provide suitable protection and mitigation of impacts.

Supporting Information

National Electricity (Victoria) Amendment Bill 2020
https://www.legislation.vic.gov.au/bills/national-electricity-victoria-amendment-bill-2020

Renewable Energy Action Plan - Energy Victoria
https://www.energy.vic.gov.au/__data/assets/pdf_file/0027/74088/REAP-FA5-web.pdf

Energy Networks Australia - Network Innovation Discussion Paper July 2017
https://www.energynetworks.com.au/resources/fact-sheets/network-innovation-discussion-paper/

AEMO Regulatory Investment Test for Transmission (RIT-T)
https://aemo.com.au/initiatives/major-programs/western-victorian-regulatory-investment-test-for-transmission/about-the-program

WVTNP Project Specification Consultation Report (PSCR)
https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/victorian_transmission/2017/western-victoria-renewable-integration---project-specification-consultation-report_final.pdf

WVTNP Project Assessment Draft Report (PADR)
https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/victorian_transmission/2018/western-victoria-renewable-integration-rit-t-padr.pdf

WVTNP Project Assessment Conclusions Report (PACR)
https://aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Victorian_Transmission/2019/PACR/Western-Victoria-RIT-T-PACR.pdf

National Parks Act 1975 Schedule 2B
http://classic.austlii.edu.au/au/legis/vic/consol_act/npa1975159/

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
https://www.environment.gov.au/epbc

IUCN Protected Areas - Category II: National Park
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