



Understanding External Costs of Overhead Electricity Transmission

A Best Practice Approach
to Electricity Transmission
Infrastructure Development
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The evaluation of the external costs allow the negative impacts to be considered in the process to identify the optimal transmission development path.





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We must strive
to achieve
decarbonisation
targets whilst
preserving social,
environmental and
economic standards.

Introduction

Overhead electricity transmission infrastructure has potential to cause a wide range of social, environmental, and economic impacts, which are currently not integrated into cost-benefit mechanisms in Australia such as the Regulatory Investment Test for Transmission (RIT-T) or Integrated System Plan (ISP).

Social, environmental, and economic costs are therefore referred to as externalities or external costs.

External costs should be considered in transmission planning to rebalance the true benefits, this will lead to greater market efficiency and environmental sustainability. The evaluation of the external costs could be of great help during the cost-benefit analysis, allowing the negative impacts to be considered in the process to identify the optimal transmission development path. This could be achieved through new planning tools, such as a Strategic Land Use Assessment (SLUA), Multi-Criteria Analysis (MCA) and Economic Impact Assessment (EIA) some of which are currently being proposed by the Victorian government under its proposed Victorian Transmission Investment Framework (VTIF).

In economic terms the first step is, therefore, the quantification of economic externalities. Cumulative environmental effects, when valued in economic terms, lead to high values and cannot be neglected in decision making processes.

International best-practice indicates that route selection should always seeks to avoid impacts (external costs) in the first instance. This is often achieved by routing new transmission line developments along existing easements, utility corridors and rights of way. The routing and siting of transmission infrastructure should always seek to avoid areas of high ecological, cultural, social, economic, and aesthetic value.

While external costs will vary for each project, a summary of potential economic impacts from planning, construction, operation, maintenance, emergency repairs and long-term operation associated has been provided. These represent direct and indirect economic disbenefits that should be explored and understood and considered in any cost-benefit analysis. It is important that flow through effects are also considered to appreciate the broader economic impacts.

The purpose of this paper is to explore potential externalities that could be considered when determining the optimal transmission path with the least economic impact. Recommendations are by no means exhaustive and will vary from project to project.



Potential impacts to farming and agriculture

Overhead transmission lines can impact farm operations and increase costs for the operator. Potential impacts depend on the transmission line route, siting, design and the type of farming.

- Can impact field operations, irrigation, aerial spraying, wind breaks, and future land use
- Direct loss of land for farming purposes due to construction, acquisition and easements
- Reduced efficiency, productivity and competitiveness of affected agricultural properties due to new physical and property barrier
- Short term disruptions to business trade during the construction period (e.g. construction on farmland/agricultural businesses)
- Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly impact future crop yields
- Inability to meet Catchment and Land Protection Act obligations, ie control of weeds and pests will have a significant impact on properties
- The value of agricultural property is likely to decrease due to inhibited farm operations and visual amenity - directly affecting access to finance
- Once an easement for a transmission circuit is approved, it will always be a primary consideration for further infrastructure development, such as the addition of more transmission capacity or towers
- Permanent access to transmission infrastructure will be required for maintenance and inspection activities, thereby impacting the continuity of farming activities on the property.

The routing of overhead transmission infrastructure can cause the following agricultural impacts:

- Create problems for turning 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 other pest encroachment
- Compact soils and damage drain tiles
- Result in safety hazards due to pole and guy wire placement
- Hinder or prevent aerial spraying or seeding activities by planes or helicopters
- Interfere with moving or utilising irrigation equipment
- Limit the size of machinery and equipment useable in certain areas - limiting efficiencies of scale (for example augers)
- Hinder future consolidation of farm fields or subdividing land for residential development
- Result in loss of shelter belts to agriculture productivity (ie sheep and cattle)
- Hinder adoption of novel agricultural practices such as drones for stock work, aerial spraying and surveying as activities are prohibited within proximity of easement
- Result in loss of biodiversity
- The requirement for access tracks to every tower will impact the productivity of every paddock that provides access to, or contains, transmission equipment
- Land set aside for access tracks needs to be permanently usable by heavy vehicles during periods of significant rainfall. Consequently, making tracks resilient through surface modification sterilises that soil, making it unsuitable for further agricultural use
- Reduction in the productivity or profitability of farming businesses can have significant flow through for the local economies
- Reduction in the crop outputs can present significant concern for any downstream food processing



Regional Appeal

- High potential for a decrease in the attractiveness of towns to future residents relative to current conditions, at least in areas proximate to or in view of the transmission lines
- Implications for population attraction and retention, property values and businesses relying on population-led demand
- Urban growth land may be impacted depending on the final alignment. This includes current and future development area, efficient development and investment value
- A material reduction in land supply available for new housing will have implications for housing availability, choice and affordability.

Landscape and neighbourhood amenity

Globally, there is growing evidence that the health of our economic and social wellbeing is directly related to the health of our environment. This is reflected Parks Victoria's Healthy Parks Healthy People approach to park management. According to Parks Victoria, healthy parks provide significant amenity benefits to surrounding residents.

This document identifies there are around 12,000 residences immediately adjacent to Melbourne parks and 85,000 residences adjacent to parks outside the Greater Melbourne area. A conservative estimate of the amenity value for those residents immediately adjacent to Melbourne's metropolitan parks alone is \$21–28 million per year.

This is based on international studies on the relationship between urban and peri-urban parks and housing prices, which can be used as a proxy for the value of improving people's welfare or wellbeing.

Biodiversity - our natural capital

The term 'natural capital' is used to describe the resources provided by nature – minerals, soil, water, ecosystem services, and all living things from which we derive material or financial value. Biodiverse ecosystems are the core component of natural capital. For example, Victoria's agriculture, forestry and fisheries sectors, which directly rely on natural capital, contribute around \$8 billion, or 2.8 per cent, to annual Gross State Product (GSP). The physical presence of transmission lines can have an effect on wildlife and natural capital. These potential effects include long-term changes to habitat, bird strikes, access issues, noise effects and associated avoidance behaviour, and electric and magnetic fields.

Fragmenting habitat for transmission line easements will impact biodiversity by:

- Altering the types of wildlife found in an area, threatening already threatened species
- Limits the ability of wildlife to move to larger areas for food, breeding and genetic diversity
- Creates more edge habitat
- Increases mortality risks to birds.

There is nothing more important to our existence than a healthy natural environment. We need to stop the decline of our biodiversity and ensure that our natural environment is healthy, valued and actively cared for. Biodiversity is fundamental to the health, wellbeing and prosperity of current and future generations.

- It reduces the impacts of climate change
- It is important to Victorians' identity
- It is vital to tourism – for example, Victoria's parks alone bring in \$1.4 billion each year
- It is fundamental to the cultural practices of Aboriginal Victorians
- It has intrinsic value and a right to exist, regardless of human considerations.

A study of the economic benefits of Victoria's national parks and conservation reserves showed the range of benefits that parks provide. These contributions highlight the potential exposure of the economy if our natural capital is eroded by external impacts such as inappropriate infrastructure development, pollution, overuse, inadequate management of threats and climate change, which can degrade the condition of ecosystems and their ability to generate or support the provision of essential products and services.



Valuation of benefits from parks

The following figures are based on valuation of benefits from Victoria's parks

- Tourism: \$1.4 billion in spending per year associated with visits by tourists to Victoria's parks, generating \$1 billion gross value added to the state economy and 14,000 jobs
- Health benefits: visits to parks are estimated to save Victoria between \$80 million and \$200 million per year from avoidance of disease, mortality and lost productivity
- Water purification: avoided costs estimated at \$33 million per year in metropolitan areas and \$50 million per year in non-metropolitan areas
- Flood protection: \$46 million per year from avoided infrastructure costs
- Carbon sequestration: Victoria's terrestrial parks store at least 270 million tonnes of carbon
- Marine parks store at least 850,000 tonnes. In addition, Trust for Nature reserves and covenants are estimated to store a further 12 million tonnes of carbon.

Tourism

Impacts on tourism can be broad and varied depending on the proposed location of overhead transmission infrastructure. The following examples have been provided from analysis of the proposed Western Renewables Link in western Victoria.

- High potential for negative impact on natural amenity and views which would directly conflict with the tourism brand and reasons for visit which are often based on scenic values and nature-based assets. The economic contribution of park-attributable tourism
- High potential for impacts on tourism and related businesses including future tourism initiatives such as the Bald Hill Activation Project in Bacchus Marsh
- Many regional landowners operate tourism businesses on their land. These businesses need to be identified and the economic impact understood
- Significant adverse impact on the development of Agri-tourism in the district. There are many farms within the area hosting farm-stays, BnBs, trail-rides, and glamping
- Significant adverse impact on commercial hot-air balloon flight paths and landing zones in the Myrning / Korobeit / Mt Prospect areas.

Recreation and well-being

The enjoyment that visitors obtain from visiting parks is estimated at \$600–\$1,000 million per year across Victoria. Around 23 million visits to parks per year are primarily for physical activity which can provide a wide range of health benefits.

An indicative analysis suggests that the avoided healthcare costs and productivity impacts associated with undertaking physical activity regularly in Victorian parks could be up to \$200 million per annum. Recreation areas include parks, trails, lakes, or other areas where recreational activities occur. Transmission lines can affect these areas by:

- Discouraging potential users of recreational areas whose activities depend on the aesthetics of natural surroundings (e.g., backpackers, cyclists, hikers)
- Impacting the well-being benefits obtained through recreation
- Impacting the economic benefit to recreation related and supporting businesses.





Visual amenity

The overall aesthetic effect of an overhead transmission line is likely to be negative to most people, especially where proposed lines would cross natural landscapes and private properties. Development of overhead transmission lines changes the landscape and impacts visual amenity. Changes in amenity can create economic impacts to regions, towns, residents and businesses that rely on or are drawn to visual amenity.

Aesthetic impacts depend on:

- The physical relationship of the viewer and the transmission line (distance and sight line)
- The activity of the viewer and duration of the impact (e.g., living in the area, driving through, or sightseeing)
- The number of observers from a physical location or region (such as a materially populated town)
- The contrast between the transmission structures and the surrounding environment, such as whether the line stands out or blends in.

A overhead transmission line can:

- Degrade the surrounding environment (e.g., intruding on the view of a landscape)
- Change the context of the view shed (e.g., evoking an image of development in a previously rural area)
- Introduce direct and cumulative visual impacts on residences, public viewpoints and the surrounding landscape
- Impact on the landscape character and significant landscape features
- Impact the integrity of significant physical landforms and environmental values

Property impacts

Concern relates to how some property owners bear the economic burden so that everyone else can use the electricity, pitting property owner rights versus public benefit. Another concern relates to who should be considered as affected by the new line, IE properties with easements and infrastructure as well as neighbouring properties.

- Potential decline in property values due to the proximity or land or dwelling to a new transmission line
- Potential decline in property values due to easement acquisition or use
- Loss of visual amenity and associated economic losses
- CFA Restrictions: CFA will not fight structural or grass fires in close proximity to transmission lines due to safety concerns
- Property owner Insurance impacts due to risks associated with infrastructure
- Electricity transmission lines generate both electrical and acoustic noise. Electrical noise can severely degrade radio and television reception over large distances, depriving property owners or even communities of reliable access to those services
- Property development is limited by the proximity of transmission infrastructure due to the need to maintain safe separation between structures and transmission lines
- Overhead transmission lines hinder adoption of novel agricultural practices such as drones for stock work, aerial spraying and surveying as activities are prohibited within proximity of easement

How much overhead transmission lines decrease the value of a property varies. Studies range from survey-based research that provides important context to regression analyses of sales data to less formal appraisal-based sales analyses. A 2018 study from the Journal of Real Estate Research found that vacant lots hosting or next to high-voltage overhead lines sell for 44.9% less than equivalent lots that aren't located near lines. A lot that is located within 300 metres of transmission lines tends to sell for 17.9% less. Other studies suggest that proximity to overhead lines may lower a property's value from 10 to 40 percent.



Aviation impacts

General aviation, hang gliding, paragliding, skydiving, balloon, and kite flying must avoid accidental contact with overhead lines. Development of large scale renewable infrastructure means that new overhead transmission lines are sometimes routed near existing aviation activity bases which can result in safeguarding issues due to collision risk.

- Ambulance, police, rescue, commercial, tourism, recreational and private air services flying in the vicinity of overhead transmission lines can be at risk when flying at reduced altitudes
- These risks presents service level impacts affecting commercial revenues and has potential to add significant liability risk in the event that there is a wire strike accident
- Aerial firefighting activities can be adversely impacted in high-risk bushfire prone regions with potential for transmission infrastructure and property to be damaged. Fires can also cause more damage to infrastructure and increase risk to life due to additional delays incurred in aircraft needing to avoid transmission lines.



Extreme weather events

Damage to overhead transmission infrastructure due to extreme weather events often provides network service providers with the opportunity to recover their costs via cost pass through arrangements. This results in repair costs being carried by consumers. In recent years, there has been an increase in the cost pass through applications being submitted for damage sustained from natural hazards. Summarised below are a list of cost pass through applications made for transmission infrastructure in the period 2015-2020. Applications are expected to increase in line with predictions of increased severe weather events.

Application Date	Network Operator	Nature of Event	Economic Cost
31 August 2020	Endeavour	Bushfire	\$31.27 million
31 July 2020	Ausgrid	Storm	\$37.6 million
10 July 2020	AusNet Services	Wind	\$25.07 million
14 May 2020	AusNet Services	Bushfire	\$21.50 million
21 August 2015	Ausgrid	Storm	\$43.20 million

There is enormous economic value in driving systemic change in Australia's resilience planning. By 2050, the annual cost of natural disasters in Australia is expected to more than double – from \$18 billion per year to more than \$39 billion. Findings from a study commissioned by the Australian Business Round Table for Disaster Resilience and Safer Communities indicate that natural disaster events cost Australia's economy on average \$13 billion every year, highlighting the need for proactive resilience measures.

An estimate of pass through costs or risk percentage could be factored into any cost-benefit analysis.

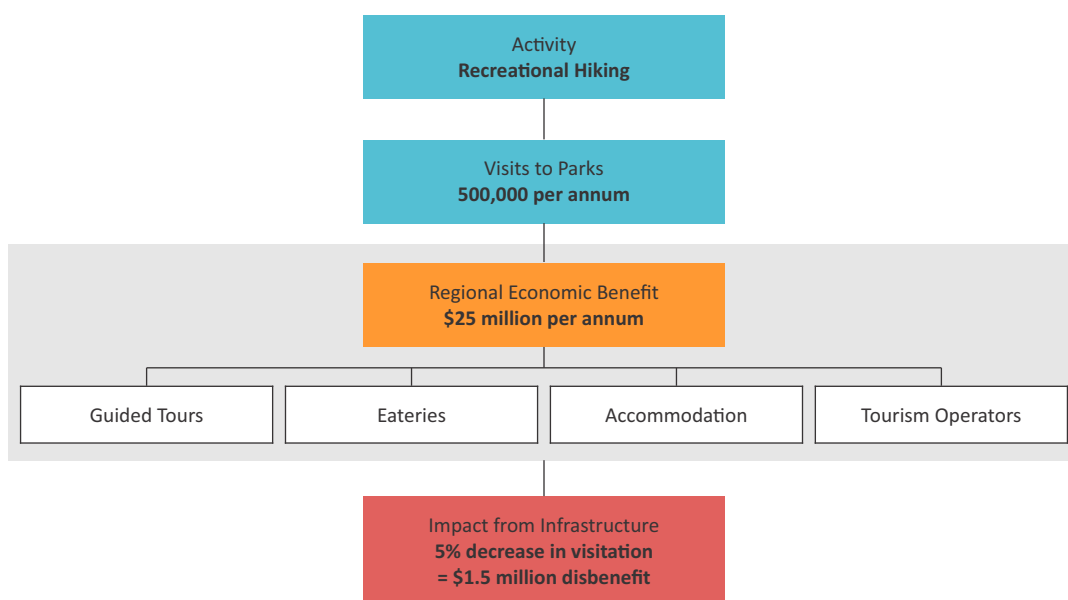


Potential for flow-through economic impacts

When considering economic impacts, it is important that flow through effects are also considered. For example:

- A decline in visits to regional parks, results in economic impact to a range of stakeholders not directly associated or located within the park
- A decline in wedding photography bookings at a wildflower farm through loss of visual amenity directly impacts catering businesses, photographers and nearby accommodation providers
- Decline in agricultural production impacts workers, logistics companies, wholesale operations, food processing operations and retailers
- Reduction in the productivity or profitability of farming businesses can have significant flow through for the local economies
- Reduction in the crop outputs can present significant concern for any downstream food processing
- Hindering agricultural practices such as drones for stock work, aerial spraying, seeding and surveying can impact local businesses providing these services
- Reduction in property values will reduce Council rates which impacts municipal revenues and economic development of municipalities.

Figure 1: Example of flow-through effects using indicative industries and costs.





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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