CONFIDENTIAL

Victorian Farmers Federation

White Paper

Renewable Energy and transmission - Co-existence with Agriculture

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I. Introduction

This submission provides a brief overview of the factors that farmers consider when determining the impact of renewable energy generation, storage or transmission on their farm business.

Failure to understand the restrictions that renewable energy and transmission can have on agriculture is driving the loss of social license and landholder resistance to hosting infrastructure.

Energy experts and safety regulators do not always understand farming practices and farmers are rarely consulted in changing energy safety regulations.

As farming systems evolve to meet local physical, climatic and regulatory environments and each state has different safety regulations there is a gap our understanding of how to plan for renewable energy infrastructure that is seen as a benefit to the farm business.

II. Renewable energy impacts on farm businesses?

Renewable Energy and Transmission are predominantly located on farmland. Energy generators need landholder consent to gain access to farmland for wind or solar however transmission lines are planned based on compulsory acquisition of an easement.

The difference between what is promised and what is delivered was eroding the social license of renewable energy generators. This has been exacerbated by transmission planning processes that approve projects without understanding of impacts on landholders along the routes.

Over the past decade the VFF has seen the energy sector see farms as a single entity. Farms are complex. Different commodity types will have different interactions with renewable energy. Within commodity types there can be differences based on soils, climate, production system, machinery used etc.

There is increasing demand for farmland – for urban expansion, for plantation timber, for sequestration, for hosting infrastructure. Transition to a renewable energy future needs to be driven by a commitment to renewable energy co-locating with agriculture.

This submission seeks to highlight the issues that need to be addressed to ensure renewable energy generation, storage and transmission infrastructure is in the most appropriate location and uses the right technology, is designed to minimise conflicts with agriculture and ensures landholders are compensated for impacts to farm business.

Lack of Regulatory oversight

Renewable energy and transmission if predominantly located on farming land. For farmers to want to engage with the energy transition they need to understand what it means for their business and trust that the Government will ensure that there is regulatory oversight to ensure they are treated fairly.

The Australian Energy Infrastructure Commissioner's (AEIC's) Report to Minister Bowen highlights that energy proponents do not always act in a fair and reasonable manner. Without regulatory safeguards they act to maximise profits by transferring costs to others.

As most decision makers are not familiar with farm production the planning process is failing to ensure that the impacts to landholders from infrastructure are known, avoided where possible and compensated for where they are not.

What information is needed to determine commercial consent?

To achieve commercial consent from landholders and to minimise the loss of community support it is critical for proponents and decision makers:

- Understand the type of production in an area;
- Understand the potential conflict their proposal may have on the production system in place, including safety regulations;
- Be willing to design and locate infrastructure to minimise impact on land use;
- Understand the need to protect soil and to ensure soil structure and health is maintained;
- Ensure that the project is viable once full compensation / commercial consent is factored in.
- Develop land access, biosecurity, compensation and rehabilitation plans that reflect landholder feedback and requirements.

Currently there is very little attention paid to potential conflict or co-existence within energy companies. Without regulatory oversight to ensure generators disclose potential conflicts to landholders they will not do so as this would either reduce the likelihood of access to land being granted or would increase the price required to reach commercial consent. There is often no desire for companies to collect any data on operational experience from the farmer view. This drives the loss of landholder trust in companies and broader social license issues.

Table 1, 2 and 3 demonstrate the difference between energy why farmers question energy industry statements regarding compatibility of renewable energy infrastructure and agriculture. Predominantly energy companies and planning guidelines focus on the co-existence in relation to agriculture and constraints / costs to their business in relation to conflict – for example sheep will be promoted as the farming activity for solar, even if the existing use was livestock or horticulture.

Farmers look at the operational context and regulatory interactions in determining conflict or co-existence. Just because wheat can grow under a solar panel does not mean it can be safely and efficiently planted, fertilised and harvested under a standard solar array.

*Table 1 – indicative co-existence and conflict between wind turbines and agriculture systems.*1*

	Co-existence	**Constraints**
Grains	*Physical* Payments are made to compensate for loss of productive area from hosting turbines. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	*Physical* Tower construction damages soil (compaction) Tower footings are permanent impacts on soil and drainage. Towers are a barrier to efficient machinery movements. Roadways and turbine bases sterilise land from production. Spread of weeds or disease from poor biosecurity control. *Regulatory* Towers restrict use of machinery around the towers. Impacts on efficient use of machinery in easements. Impacts use of aerial spraying. *Financial* Increase in CIV (basis of farm rates). Increased use of fuel and chemicals. Impact of chemicals on grain quality / shipment acceptance. *OH&S* Access to areas within withholding periods. (chemical exposure) Risks from blade strike and debris, including damage to machinery.
Livestock	*Physical* Where payments are made to compensate for loss of productive area from hosting turbines. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential	*Physical* Loss of aerial spraying or aerial mustering. Spread of weeds or disease. *Financial* Increase in CIV (basis of farm rates). Impact of chemicals used on animal health and acceptance of shipment. Loss of production (injury, death, mismothering). *Regulatory* Towers restrict use of machinery around the towers.

[1] **Refer to Attachment one for detail on agriculture land use conflict and attachment two for detail on irrigation. Attachment four gives more detail on physical impacts of wind and transmission.

	constraints on their operations for consideration of commercial consents.	Impacts on efficient use of machinery in easements. Impacts use of aerial spraying. *OH&S* Use of 'mustering' tools such drones or helicopters by energy companies without the understanding of how livestock react can lead to causing risk to livestock and humans. Risks from blade strike and debris, including damage to machinery.
Dairy	*Physical* Likely to require more significant payments to compensate for loss of productive area from hosting turbines. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	*Physical* Loss of aerial spraying or aerial mustering. Spread of weeds or disease during access. Interference with movement of livestock to dairies. Impact with strip feeding and stock containment areas. *Regulatory* Towers restrict use of machinery around the towers. Impacts on efficient use of machinery in easements. Impacts use of aerial spraying. *Financial* Increase in CIV (basis of farm rates). Impact of chemicals used on animal health and acceptance of shipment. Loss of production (injury, death, mismothering). *OH&S* Use of 'mustering' tools by energy companies causing risk to livestock and humans. Risks from blade strike and debris, including damage to machinery.
Horticulture (tall)	*Physical* Rarely built on horticulture areas as footprint unlikely to be fully compensated for (commercial consent). May reduce frost risk (if operating) *Regulatory*	*Physical* Loss of productive area to turbine bases and access easements. Potential restrictions on use of horticulture structures. Loss of aerial spraying. Spread of weeds or disease during access.

	Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	*Regulatory* Towers restrict use of machinery around the towers. Impacts on efficient use of machinery in easements. Impacts use of aerial spraying. *Financial* Increase in CIV (basis of farm rates). Impact of chemicals used on animal health and acceptance of shipment. Significant reduction in production value due to loss of productive area. *OH&S* Risks from blade strike and debris, including damage to machinery.
Horticulture (small)	*Physical* Rarely built on horticulture areas as footprint unlikely to be fully compensated for (commercial consent). *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	*Physical* Loss of productive area to turbine bases and access easements. Potential restrictions on use of horticulture structures. Loss of aerial spraying. Spread of weeds or disease during access. *Regulatory* Towers restrict use of machinery around the towers. Impacts on efficient use of machinery in easements. Impacts use of aerial spraying. *Financial* Increase in CIV (basis of farm rates). Impact of chemicals used on animal health and acceptance of shipment. Significant reduction in production value due to loss of productive area. *OH&S* Risks from blade strike and debris, including damage to machinery.
Intensive Animal Industries	*Physical* Location of turbines and access at significant distance from shedding. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning).	*Physical* Restrictions on the location of shedding. Spread of weeds or disease during access. *Regulatory* Biosecurity practices. Impacts on onsite burials post disease or smothering event.

	Financial Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	*Financial* Increase in CIV (basis of farm rates). Significant risk if access leads to mass death event. *OH&S* Risks from blade strike and debris, including damage to machinery. Risk from zoonotic disease.
irrigation	*Physical* Rarely built on irrigation areas as the footprint and the change in effectiveness of irrigation system as unlikely to be fully compensated for (commercial consent). *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	*Physical* Impacts on the use of centre pivot and lateral irrigation. Impact on drainage. *Financial* Significant reduction in productivity if unable to irrigate.

Table 2 – indicative co-existence between solar panels and agriculture systems.[2]*

	Co-existence	**Constraints**
Grains	The nature of solar installations in Australia are in direct conflict with grain production in Australia. *Physical* Vertical panels at 35m widths and 35m clear zone at top and bottom to allow tractor turning. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	*Physical* Tractors can be 5.5m high. Boom spray can be 30m wide. Traditional solar arrays would not allow the use of machinery. Spread of weeds or disease during access. *Regulatory* Inability to stubble burn. *Financial* Increase in CIV (basis of farm rates). Increased costs to manage weed and disease. Loss of income from cropping.
Livestock	*Physical* Sheep. Height of array provides shelter and shade. Cattle. Would require arrays that were wider and more elevated. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents. Requires enforceability of commercial contract conditions (siting, decommissioning).	*Physical* Sheep can become caught in solar panels and supports leading to injury. Cattle can cause damage to systems from rubbing / pushing against poles. Potential for injury to livestock from corners or sharp edges of installations. Inability to use boom sprays or aerial spraying to manage weeds. *Financial* Increase in CIV (basis of farm rates). Increased costs to manage weed and disease. *OH&S* Increased risk in mustering (obstacles). Risks from personnel being in paddocks within a chemical withholding period.
Dairy	*Physical*	*Physical*

[2] *Refer to Attachment one for detail on agriculture land use conflict and attachment two for detail on irrigation. Attachment four gives more detail on physical impacts of wind and transmission.

	Unlikely to co-exist in traditional form due to the generic 'cattle' issues and the daily movement of cattle. If modified to create rooftop solar on dairies and containment yard shedding. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	Cattle can cause damage to systems from rubbing / pushing against poles. Potential for injury to livestock from corners or sharp edges of installations. Inability to use boom sprays or aerial spraying to manage weeds. *Financial* Increase in CIV (basis of farm rates). Increased costs to manage weed and disease. Some weeds cause bloating in cattle that can lead to mortality. *OH&S* Increased risk in mustering (obstacles). Risks from personnel being in paddocks within a chemical withholding period. As cows are milked daily any residue from chemicals applied while livestock are active in the withholding period can enter the milk products.
Horticulture (tall)	*Physical* Agrivoltaics – that is array is designed to allow tractor operations, such as roofing on grow sheds or functioning as horticulture structures providing frost and hail protection. Hail protection. *Regulatory* Co-existence requires regulation that ensures enforceability of commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents. *OH&S* Manual harvesting – risks of injury from panels	*Physical* Restricts growth of vegetation. Restricts use of tractors for fertilising, spraying and harvesting. Reduced effectiveness of frost fans. restricts use of ladders for harvest. Cannot use netting structures (protect from loss from birds and bats.) Loss of productive land from footings. Potential microclimate impacts. *Regulatory* Inability to stubble burn. *Financial* Increase in CIV (basis of farm rates). Increased costs to manage weed and disease. Loss of income from cropping.
Horticulture (small)	*Physical* Agrivoltaics – when designed to allow tractor operations only. Some protection from frost. *Regulatory*	*Physical* Restricts growth of vegetation. Restricts use of tractors for fertilising, spraying and harvesting. Reduced effectiveness of frost fans.

	Needs regulatory standards on disclosure of information to allow proper consideration of commercial consent. Requires enforceability of commercial contract conditions (siting, decommissioning).	Cannot use netting structures (protect from loss from birds and bats.) Loss of productive land from footings. Potential microclimate impacts. *Regulatory* Inability to stubble burn. *Financial* Increase in CIV (basis of farm rates). Increased costs to manage weed and disease. Loss of income from cropping. *OH&S* Injury from impact with solar panels when tending crops..
Intensive Animal Industries	*Physical* Agrivoltaics – Rooftop solar for shed based industries. Shelter for range chickens. *Regulatory* Needs regulatory standards on disclosure of information to allow proper consideration of commercial consent. Requires enforceability of commercial contract conditions (siting, decommissioning).	*Physical* Pigs are likely to interact with the structures – potential for injury to livestock and damage to infrastructure. Heightened risk and consequence from poor biosecurity management. *Regulatory* Biosecurity regimes may be compromised by land access. Biosecurity practices. Impacts on onsite burials post disease or smothering event. *Financial* Increase in CIV (basis of farm rates). Significant risk if access leads to mass death event. *OH&S* Biosecurity – poultry and pigs are highly zoonotic species with additional biosecurity requirements for animal welfare and disease risk.
irrigation	*Physical* Rarely built on irrigation areas as the footprint and the change in effectiveness of irrigation system (sensitive to minor level change) as unlikely to be fully compensated for (commercial consent). *Regulatory* Co-existence requires regulation that ensures enforceability of	*Physical* Can impact on co-existence where irrigation is used due to changes to sub surface drainage or level change. Unlikely to allow the use of efficient irrigation systems such as laterals or centre pivot. *Regulatory* Potential inability to use flood irrigation or overland drainage. *Financial*

	commercial contract conditions (siting, decommissioning). *Financial* Co-existence requires regulation that ensures hosts are provided information on all potential constraints on their operations for consideration of commercial consents.	Significant reduction in productivity if unable to irrigate. *OH&S* Risk from presence of electricity and water.

A safe work approach to infrastructure design requires project planners and commissioners to design projects so that existing land uses can continue to operate safely. The table below identifies the current range of issues that have not been included in the assessment of AEMO in the ISP or the Rit-t, and are important to whether the Victorian Transmission Plan Guidelines and SLUA will be successful in guiding renewable energy transition to occur with more co-location outcomes and fewer land use conflicts that are challenging to fully compensate.

The VFF believes that if this cannot occur it requires clear consideration of the long-term costs to the landholder and the broader economy throughout the VTPG process. As transmission does not require commercial consent it is critical that project planners and regulators understand the nature of conflicts between transmission and agriculture and how overhead transmission line can constrain agricultural production on farms.

Table3 – indicative conflict between transmission and agriculture systems.[3]*

	Conflict / constraints
Grains	*Physical* Tower construction damages soil (compaction) Concrete construction trucks compact soil. Reduces yield. • Farmers use tramlines to reduce impact on soils. Changing operations to avoid having empty chaser bins under the lines etc increases costs and soil compaction and reduces yields. Tower footings are permanent impacts on soil and drainage. Towers are a barrier to efficient machinery movements. This increases inputs and generally lowers productivity. • Difficult to use wide machinery such as boom sprays. These can be damaged if they impact pylons. Concern with spray arm raising if one side impacts the ground. Wires (interference) can impact accuracy of Smart Agtech. Loss of crop from access (not on tramlines) *Regulatory* Tower and wires restrict use of machinery including tractors and associated equipment, aerial spraying, drones, stubble burning etc.

[3] *Refer to Attachment one for detail on agriculture land use conflict and attachment two for detail on irrigation. Attachment four gives more detail on physical impacts of wind and transmission.

	• Machinery over 5m high will require permits and spotters. This may be denied in hot weather (summer) impacting on harvest. Spotters add significant cost and will be difficult to source during harvest with existing labour shortages. Ausnet has reduced machinery height to 3m which will impact most farm machinery rather than maintain lines to safety standards. • Aerial spraying by planes or drones is not allowed near transmission lines. • Straight runs required for efficient use of fuel and chemicals. Changing operations to avoid having empty chaser bins under the lines etc increases costs and reduces yields. • Without GPS increases need to stubble burn. Cannot stubble burn near transmission lines. • Biosecurity (including chemical use). Concern regarding introduction of weeds and pests that will be harder to control due to restriction on tools. TNSPs use chemicals on the site that can impact on crop health and vendor declarations. *Financial* Increase in CIV (basis of farm rates). Use of chemicals impacting on crop health or ability to sell crop. • No till requires accurate GPS – even a few cm can mean the difference between killing the weed or the crop. Reduced production / profitability • Changing safety regulations are reducing area able to be farmed and therefore the earning capacity of the business. Increased use of fuel and chemicals. • The need to fence off easements (OH&S) reduces the efficiency of farming (grains producers remove fencing to have long runs) • If cannot use long boom sprays or fill chaser bins that will impact on emissions intensity and profitability. • Loss of *OH&S* • Many producers believe they will need to fence of the easement to manage safety risks from transmission lines and ESV and TNSP restrictions. • Chaser bins and boom spray wings can have varying heights – unsure about the ability to use.
Livestock	*Physical* • Construction can impact pasture and soil health. • Decommissioning of dams and stock watering in easement. • Impact on location / size of dams for stock watering. • Impact on cattle movements from access and use of drones / planes for inspection (tools used to muster – therefore can drive livestock into danger) • Impact of cattle movement from structures and fencing • Interaction between cattle and infrastructure, especially when spooked by aerial or ground inspections. • Introduction of new weeds or disease from access practices. • Impact on ability to plant trees for shelter and windbreaks. • Concern regarding interference with monitors and sensors. *Regulatory* Limits use of aerial spraying and aerial mustering. *Financial* • Use of chemicals impacting on animal welfare or ability to sell livestock.

	• Mismothering and animal welfare considerations leading to reduced number of livestock and condition of livestock leading to decreased returns. • Increased costs to manage weeds, • Additional costs of fencing (earthing) *OH&S* • Withholding periods of chemicals. • Safety risks from interactions with livestock from access.
Dairy	*Physical* • Construction can impact pasture and soil health. • Decommissioning of dams, effluent treatment ponds and stock watering in easement. • Impact on location / size of dams for stock watering and effluent treatment systems. • Impact on cattle movements from access and use of drones / planes for inspection (tools used to muster – therefore can drive livestock into danger) • Impact of cattle movement from structures and fencing • Interaction between cattle and infrastructure, especially when spooked by aerial or ground inspections. • Introduction of new weeds or disease from access practices. • Impact on ability to plant trees for shelter and windbreaks. • Stock move daily for milking. Increases risk from chemical use; physical access and biosecurity. • Will lead to creation of smaller paddocks when easements are fenced off leading to increased concentration of movements around fences – compacting soils and increasing OH&S risks. • Impact on laser graded or irrigated pasture. • Impact on siting of dairy and location of silage storage. • Concern regarding interference with monitors and sensors. *Regulatory* Limits use of aerial spraying and aerial mustering. May restrict B double access to dairy. *Financial* • Use of chemicals impacting on animal welfare or ability to sell milk products. • Mismothering and animal welfare considerations leading to reduced number of livestock and condition of livestock leading to decreased returns. • Increased costs to manage weeds, • Additional costs of fencing (earthing) and automated access gates. • Increased costs to store water for dairy washdown and for effluent treatment systems. • New access for dairy or permit processes. *OH&S* • Withholding periods of chemicals. • Safety risks from interactions with livestock from access.
Horticulture (tall)	*Physical* • Tower construction damages soil (compaction) Concrete construction trucks compact soil. Reduces yield. • Tower footings are permanent impacts on soil and drainage. • Towers are a barrier to efficient machinery movements. This increases inputs and generally lowers productivity.

	• Wires (interference) can impact accuracy of Smart Agtech. • Decommissioning of dams. • Impact on location / size of dams. • Introduction of new weeds or disease from access practices. • Impact on laser graded grow areas. • Disruption of rows impacting efficiency and increasing exposure to wind. • Changes to the type or efficiency of irrigation used • Impact on production of high value crops due to restrictions on the easement. • Tall crops / trees and horticulture structures prohibited. • Inability to use aerial tools and drones • Inability to use igloos and other structures in the vicinity of the easement *Regulatory* Tower and wires restrict use of machinery including tractors and associated equipment, aerial spraying, drones, burning of leaf matter etc. • Machinery over 5m high (including cherry pickers) will require permits and spotters. This may be denied in hot weather (summer) impacting on harvest. Spotters add significant cost and will be difficult to source during harvest with existing labour shortages. • Aerial spraying by planes or drones is not allowed near transmission lines. • Straight runs required for efficient use of fuel and chemicals. Runs will be disrupted by the easement and may need to divert around the easement when using taller machinery or chaser bins. Increases costs and reduces yields. • Biosecurity (including chemical use). Concern regarding introduction of weeds and pests that will be harder to control due to restriction on tools. TNSPs use chemicals on the site that can impact on crop health and vendor declarations. • Biosecurity (including chemical use) potential for significant impact on soils / productivity *Financial* Increase in CIV (basis of farm rates). Use of chemicals impacting on crop health or ability to sell crop. Reduced production / profitability, including increased use of fuel and chemicals. Changing safety regulations are reducing area able to be farmed and therefore the earning capacity of the business. • The need to fence off easements (OH&S) reduces the efficiency of farming • If cannot use elevated pickers or fill chaser bins that will impact on emissions intensity and profitability. *OH&S* • Many producers believe they will need to fence of the easement to manage safety risks from transmission lines and ESV and TNSP restrictions. • Increased compliance cost – harvesting fruit and nuts at a height.

Horticulture (small)	*Physical* • Tower construction damages soil (compaction) Concrete construction trucks compact soil. Reduces yield. • Tower footings are permanent impacts on soil and drainage. • Towers are a barrier to efficient machinery movements. This increases inputs and generally lowers productivity. • Wires (interference) can impact accuracy of Smart Agtech. • Decommissioning of dams. • Impact on location / size of dams. • Introduction of new weeds or disease from access practices. • Impact on laser graded grow areas. • Disruption of rows impacting efficiency and increasing exposure to wind. • Changes to the type or efficiency of irrigation used • Impact on production of high value crops due to restrictions on the easement. • Inability to use aerial tools and drones • Inability to use igloos and other structures in the vicinity of the easement *Regulatory* Tower and wires restrict use of machinery including tractors and associated equipment, aerial spraying, drones, burning of leaf matter etc. • Aerial spraying by planes or drones is not allowed near transmission lines. • Straight runs required for efficient use of fuel and chemicals. Runs will be disrupted by the easement and may need to divert around the easement when using taller machinery or chaser bins. Increases costs and reduces yields. • Biosecurity (including chemical use). Concern regarding introduction of weeds and pests that will be harder to control due to restriction on tools. TNSPs use chemicals on the site that can impact on crop health and vendor declarations. • Biosecurity (including chemical use) potential for significant impact on soils / productivity *Financial* Increase in CIV (basis of farm rates). Use of chemicals impacting on crop health or ability to sell crop. Reduced production / profitability, including increased use of fuel and chemicals. Changing safety regulations are reducing area able to be farmed and therefore the earning capacity of the business. • The need to fence off easements (OH&S) reduces the efficiency of farming • If cannot use elevated pickers or fill chaser bins that will impact on emissions intensity and profitability. *OH&S* • Many producers believe they will need to fence of the easement to manage safety risks from transmission lines and ESV and TNSP restrictions.
Intensive Animal Industries	*Physical* Restriction of shedding in the vicinity of the easement. Effluent ponds and treatment systems disallowed near easement. Impact on location / size of dams for stock watering, washdowns. *Regulatory*

	Pigs and poultry have specific biosecurity arrangement and the need for specific washdowns and hygiene practices. Impact on ability to bury livestock on site (emergency response) *Financial* • Shedding. Potential loss if access led to mass mortalities. Increase in CIV (basis of farm rates). Use of chemicals impacting on free range livestock.
Emergency Response	*Regulatory* Concerns regarding safety egressing under powerlines in thick smoke given SoPs regarding safe access to easements. Concern that farm houses, sheds and places of last resort may be left undefended due to restricted access by ground and air resources.

Gaps in current guidance materials

The available material for planners to assess agricultural impacts / co-existence is predominantly written by organisations without operational understanding of farming such as the Clean Energy Council (CEC) *Australian Guide to Agrisolar.* These guides are a good start, but they do not understand the machinery used and the interactions with energy safe regulations. By saying ground solar is compatible with horticulture they are not giving context to whether the standard ground solar installation allows crop management or harvest by tractors.

This leads to the need to understand conflict, co-existence and co-location and to embody that knowledge in renewable energy planning and approvals processes.

III. How to achieve co-location of renewable energy infrastructure with agriculture.

Co-location

Co-location is a term used by VCAT in *Helios Volta Holdings.* VCAT found the balance between solar farm and agricultural land uses is achieved where co-location is evident, defined as where solar facilities are '*subservient to agriculture…(and) acting to support ongoing agricultural activities within productive areas*'. This is a similar concept to the "in conjunction with" test in planning, where the new use is secondary to the primary use of the land.

Madeline Taylor in Planning the Energy Transition: A Comparative Examination of Large-Scale Solar Energy Siting on Agricultural Land in Australia approvals in Australia are undertaken in the planning system, with differences in each state.

The VFF believes a key shortcoming of the current regulatory system in Victoria is the clear gap of understanding on how to ensure renewable energy generation, transmission or storage is 'subservient' to agriculture, especially when there is no commercial consent.

Renewable energy is predominantly located in the Farming Zone the following decision guidelines should be applied to proposals.

1. *'Whether the use or development will support and enhance agricultural production.*
2. *Whether the use or development will adversely affect soil quality or permanently remove land from agricultural production.*
3. *The potential for the use or development to limit the operation and expansion of adjoining and nearby agricultural uses.*
4. *The capacity of the site to sustain agricultural use.*

These applications are primarily assessed in Melbourne by DTP staff on behalf of the Minister for Planning. There is very little policy guidance or practice notes to assist urban planners apply these tests.

There is very little guidance to the energy industry or regulators on how energy infrastructure may restrict agricultural production. Madeline Taylor in *Planning the Energy Transition: A Comparative Examination of Large-Scale Solar Energy Siting on Agricultural Land in Australia* states that "*Solar energy development land requirements have led to concern over the lack of strategic land use planning, resulting in potential impacts on agricultural soil quality, soil drainage, and future agricultural production*." ... *"Despite solar energy development increasingly being sited on agricultural land there is a lack of Australian comparative legal studies specifically examining large-scale solar energy regulation on agricultural land."*

The failure to address inherent conflicts between renewable energy and agriculture for projects with commercial consent has led to significant delays to transmission projects as project planners have not understood the implications of their proposal on farm businesses.

The VFF has discovered that there are even fewer studies that investigate the actual co-existence, colocation or conflict between renewable energy (including transmission) and agriculture, including an understanding of the machinery used and the safety and other regulatory framework that farmers must comply with. The only guideline available to decision makers is from the Clean Energy Council. It uses European research, often from university trials to determine compatibility. It does not consider safety regulations or the ability to operate farm machinery.

The VFF has assessed Energy Safe regulations and publications from TNSPs in relation to operational restrictions and spoken to farmers to understand what this means for their farming practice. After four years of seeking clear answers on can you place a crop in a chaser bin without the need for two spotters farmers are yet to receive an answer.

There is an urgent need for guidelines to be produced for the Australian regulatory context. Wind turbines and overhead powerlines can restrict the use of drones and air operations on farms. Solar development is often incompatible with the use of tractors (cropping) and transmission also restricts the height of machinery and may require whole of farm drainage and operation if irrigation systems need to be altered.

The challenges Taylor discusses in relation to planning for solar energy are even greater in relation to transmission where the landholder is unable to give commercial consent. Government promoting renewable energy without understanding inherent land use conflicts between renewable energy and agriculture has led to failure to have the appropriate regulatory structure to ensure the design and approval of renewable energy and transmission does not lead to competition between uses and perverse outcomes for agricultural land.

It is misleading for companies to produce materials that are not honest relating to potential impacts. Pamphlets with a tick against cropping where the existing machinery used would require monthly permissions for use and spotters.

Taylor states that "*Strategic, comprehensive, and holistic planning is thus key to the successful and sustainable implementation of both onshore and offshore renewables and the realisation of co-benefits.*" Government cannot rely on the energy industry providing reliable information on the impact of their proposals on farming. That will not deliver co-benefits.

Farmers would not be resisting renewable energy and transmission if Government was ensuring that the regulatory processes for were ensuring renewable energy facilities, including transmission, delivers a secondary income for agricultural landholders to improve economic resilience and dual use of land to achieve co-location of energy and agriculture. A payment to reduce losses incurred is not a co-benefit.

Proper consideration of avoiding land use conflict and designing for co-benefit is essential if we are to achieve a regulatory system that delivers co-location outcomes. Attachment 3 includes learnings from renewable energy and transmission projects for inclusion in approvals guidelines.

Recommendation

It is recommended that the government work with the VFF to create a renewable energy and transmission assessment guide that outlines how co-location with agriculture can be achieved and to identify potential conflicts with existing agricultural land uses so that proposals have eliminated the conflict.

How to assess and resolve conflict issues between renewable energy and agriculture.

Despite more than a quarter of a century in developing renewable energy facilities on farming land the Government has failed to monitor whether the approvals processes properly resolved impacts of proposal on agriculture or worked to ensure regulatory oversight of private company activities on private land.

The AEIC *Community Engagement Review* for Minister Bowen looks at the potential process improvements for projects where there is already commercial consent from the landholder. The Albanese Government stated that *Communities and landholders deserve better engagement, which is why the Government has accepted in principle all nine recommendations made by Commissioner Mr Andrew Dyer. These include:*

- *reducing unnecessary community engagement (where infrastructure will not ultimately be located) by improving the way project sites are selected*
- *increasing early local collaboration*
- *revising planning and approval processes to be more transparent and streamlined when it comes to community feedback*
- *motivating developers to ensure best practice engagement*
- *improving complaints handling*
- *keeping communities better informed on energy transition goals, benefits and needs; and*
- *equitably sharing the benefits of the transformation.*

These high-level objectives cannot be achieved without understanding what is driving the concern of the agriculture sector. What are the learnings for site selection? What information to landholders need?

Table 5 summarises knowledge gaps in what needs to be resolved to deliver co-existence or preferably co-location for different agriculture commodity systems. Co-existence is based on recognition that farm production has been reduced and that commercial arrangements are required to choose to host energy infrastructure. Co-location is the preferred outcome where the energy infrastructure has been designed to mitigate the impact on farm operations.

Table 4 – indicative co-existence and co-location between transmission and agriculture systems.[4]*

	Co-existence	Co-location
Grains	Option to run livestock in corridor – but would require fencing needing a permit and earthing. Would impact on efficient movement of machinery. Annual compensation payments or commercial consent required to negate business impacts. Needs regulatory standards on disclosure of information to allow proper consideration of commercial consent. Requires enforceability of commercial contract conditions (siting, decommissioning).	Would require significant redesign to ensure that farm productivity was not reduced. This would include micro siting of towers at the edge of paddocks and ensuring access ways are narrow and act to minimise soil compaction. Restrictions on use of traditional post and wire fences. HVDC at edge of property / road reserve would be more likely to achieve co-locations as overhead would require significantly higher towers which would require deeper foundations with impact on soil and drainage. Co benefit payments required to cover residual impacts. The current figure is close to the impact per annum from direct easement impacts on businesses but is not a 'benefit'.
Livestock	Potential for compatibility with design. Annual compensation payments or commercial consent required to negate business impacts. Needs regulatory standards on disclosure of information to allow proper consideration of commercial consent. Requires enforceability of commercial contract conditions (siting, decommissioning).	Co-location would require micro siting of towers to reduce impacts on farm operations Co benefit payments required to cover residual impacts. The current figure is close to the impact per annum from direct easement impacts on businesses but is not a 'benefit'.
Dairy	Potential for compatibility with design. Needs regulatory standards on disclosure of information to allow proper consideration of commercial consent. Requires enforceability of commercial contract conditions (siting, decommissioning).	Co-location would require micro siting of towers to reduce impacts on farm operations. Including ensuring free movement of dairy cattle (without fencing); clear zones to dairies, dams and effluent bonds. Co benefit payments required to cover residual impacts. The current figure is lower than the impact per annum from direct easement impacts on businesses but is not a 'benefit'.
Horticulture (tall)	Option to run livestock in corridor – but would require fencing needing a permit and earthing. Would impact on	Would require significant redesign to ensure that farm productivity was not reduced from restrictions on the easement and the footprint of the pylons

[4]*Refer to Attachment one for detail on agriculture land use conflict and attachment two for detail on irrigation. Attachment four gives more detail on physical impacts of wind and transmission.

	efficient movement of machinery. Significant impact on profits.	HVDC at edge of property / road reserve required as overhead would require significantly higher towers which would require deeper foundations with impact on soil and drainage. Co benefit payments required to cover residual impacts. The current figure is significantly lower than the impact per annum from direct easement impacts on businesses but is not a 'benefit'.
Horticulture (small)	Option to run livestock in corridor – but would require fencing needing a permit and earthing. Would impact on efficient movement of machinery. Significant impact on profits.	Would require significant redesign to ensure that farm productivity was not reduced from restrictions on the easement and the footprint of the pylons HVDC at edge of property / road reserve required as overhead would require significantly higher towers which would require deeper foundations with impact on soil and drainage. Co benefit payments required to cover residual impacts. The current figure is significantly lower than the impact per annum from direct easement impacts on businesses but is not a 'benefit'.
Intensive Animal Industries	Compatible if transmission located distant from shedding or livestock and is designed to avoid conflicts.	Would require significant redesign to ensure that farm productivity was not reduced. This would include micrositing of towers away from shedding and truck access. Co benefit payments required to cover residual impacts.

Recommendations

DEECA, ESV, ESC and DTP should sponsor longitudinal studies documenting the impact on farm production from renewable energy and transmission.

DTP should undertake regular reviews of planning and EES approvals processes and guidelines to ensure these processes minimise on farm impacts.

VicGrid should review the Victorian Transmission Plan and SLUA based on information from the longitudinal studies.

How to reduce confusion over safety.

Much of what the energy industry calls 'misinformation' about agriculture impacts stems from inconsistent and unclear safety regulation. Energy Safe Victoria has regulations that are unclear in their application to agriculture. They seem to be designed around the occasional use of a cherry picker or crane near powerlines. Terms like it is an offense to expel material in the direction of a transmission line could have a literal interpretation that prohibits the use of a header to harvest a crop.

The ability of Ausnet to lower the clear zone from 5m to 3m on farms rather than undertaking maintenance to resolve sagging lines shows a failure to understand farm operations. Safe work outcomes are more likely to occur where workers are involved in the process.

The VFF believes ESV must engage the agriculture sector when considering regulatory change. They should ensure TNSPs to engage with farmers when they create their company rules on what is allowed in the easement and that this does not transfer compliance costs on to farmers.

This is both a safety and a compensation issue. If farmers are not told when rules change then they are not able to adapt their OH&S procedures. When the safety rules change and then impact on the use of production systems and machinery common to the industry, then there needs to be a mechanism to ensure the farm business is compensated for the business disruption.

Safe Work Australia's *General Guide for working in the vicinity of overhead and underground electric lines* states that the proponent has a duty to ensure *so far as is reasonably practicable, the plant or structure is without risks to health and safety. Designers and manufacturers of electrical equipment or installations must ensure they are designed and manufactured so electrical risks are eliminated or, if this is not reasonably practicable, minimised so far as is reasonably practicable.*

Recommendations

DEECA and Energy Safe Victoria should be ensuring that energy generation, transmission, distribution or storage on farms should be designed in such a way to:

- **Ensure that normal farm operations can continue without the need for permits or spotters;**
- **Ensure that the infrastructure is constructed to have minimal impact on soil health and fertility and drainage and that the structure (including sub surface) can be fully removed from the site with have minimal impact on soil health and fertility.**

The need for a Positive Duty

Currently there are no positive duties on energy companies to ensure that landholders are fully informed regarding the operational issues relating to their infrastructure.

Each company can create their own guidelines or requirements relating to safety and these are not provided to all landholders. This leads to increased confusion and concerns that safety compliance costs are being transferred to landholders. Legitimate questions or concerns are not responded to or dismissed as misinformation.

Attachment 4 includes examples of confusing and conflicting guidance from TNSP's.

Recommendation

DEECA and Energy Safe Victoria should ensure that when energy regulations applied to farms impact on the use of machinery or production systems normal to that industry, that annual payments are made to ensure impacts on farm businesses are minimised. This ensures a signal is sent to TNSPs to invest in technology that avoid these impacts and keeps farmer safe.

IV. Attachment 1 – Detail on types of conflict in agriculture

Size of Machinery – physical, regulatory financial and OH&S issues

Different production systems use different sized equipment. This is increasing.

The infrastructure designed has a duty of care to design energy infrastructure to allow the ongoing use of machinery.

The tractor below has 8 steps to the cabin. Tractors can have different attachments of varying heights and widths – a sprayer, an air seeder, a combine harvester etc. This equipment is often over 5m – especially when an antenna is present. At harvest there are trucks (chaser bins) that when full can exceed 5m in height.

Energy Safe Victoria can require permissions to operate machinery between 5m and 8m. They are not ensuring that the design of transmission on farms allows a clear zone that allows for the use of machinery.

Ausnet as the TNSP has been allowed to reduce the clear zone for operation of machinery to 3m, which passes the compliance cost and the safety risk on to the farmer.

The boom spray below is close to 30m wide. This reduces the emissions intensity of the production system. The tractor alone would not be able to operate in conjunction with a traditional solar panel array.

With a wide boom spray attached it is important to keep the ground level and avoid structures and vegetation for the safe operation. If an operator entered a paddock and cause damage (ruts and elevated edges) then one wing tip can get caught and cause the other wing tip to elevate (like a see saw).

Boom Spray – Horsham Source: LJ Gervasoni

Technology – GPS. Regulatory, Financial and OH&S

Australian agriculture is reducing emissions intensity through smart technology. Soil moisture probes to identify the level of water required, GPS to allow minimum til – allowing targeted use of chemicals - e.g. spraying of the weed, not the crop. Transmission companies are saying that there is low interference – 5 or 10cm. Farmers see that as significant as the plant may only be 2cm away from the weed.

GPS agriculture allows detailed mapping of yields and inputs. This data helps drives sustainable production. It is critical that for renewable energy and transmission to be compatible with agriculture that there is no restriction on its ability to be used or its functionality.

GPS technology will also enable autosteer. This can improve OH&S outcomes but needs certainty in accuracy of signal.

Antennae on tractors add approximately 40cm to vehicle height.

Antennae on machinery. Source LJ Gervasoni

Technology – drones. Regulatory and financial

Drones are becoming a key tool in agriculture. They can apply chemicals; they can assess paddocks for hazards. Some companies are restricting the use of drones in the vicinity of their assets which will increase the competitive disadvantage of farmers hosting renewable energy infrastructure. Companies are using drones for inspections but restricting landholder use.

Aerial (planes and helicopters). Regulatory, OH&S.

When transmission lines were constructed across farms the landholders were told there was only 2 things they couldn't do – build under them or plant trees.

Many farmers believe they can operate under and around transmission as that was their practice and they were not told they could not do it or were compensated for this impact on their business.

Guidelines for VNI West and WRL are confusing. They are prohibiting use by farmers but allowing use by others. Is this a safety issue or a training issue?

In relation to wind turbines landholders within 1.5km of a turbine have raised concerns about the impact on their ability to use aerial operations due to restrictions on insurance policies. The planning

process has ignored those concerns by referring to CASA. A clear approach is needed that focuses on operational safety no matter who the operator is. Renewable energy generation and transmission should be ensuring projects are designed so that all machinery and practices in the area are not restrict the infrastructure and where this cannot be avoided the ongoing business impact is compensated for.

Biosecurity – weeds. Physical, regulatory, OH&S.

Weeds can have significant impact on biodiversity, production, animal welfare and safety. Poor hygiene practices can lead to the transfer of weeds on to properties. This then requires remedial action by landholders to eradicate the weed before it spreads. Each weed will have a different impact.

For an example wheel cactus. This is a species closely related to the prickly pear. It can spread easily and is very difficult to eradicate. It is a fruit fly vector, and the cactus spikes can injure humans and animals.

Wheel cactus is not usually grazed by stock because of its stout spines. In dense patches, the plant could hinder access to water and reduce food available for fauna.

Treatment requires injection of a restricted herbicide into the plant requiring PPE for chemicals as well as barriers to stop the penetration of PPE and clothing by the spikes.

This chemical can impact on crops and livestock and requires withholding periods.

Failure to practice good hygiene or deviation from the easement can lead to the spread of a harmful weed that is difficult to eradicate and impact production.

Biosecurity – disease. Physical, regulatory.

Different production systems have different issues relating to preventing the spread of disease to crops, livestock or humans, or on the ability for human interaction to introduce risk (eg swill feeding or leaving meat scraps near livestock.

Farmers are concerned regarding hygiene practices and may require additional processes – such as foot baths. In a disease outbreak additional requirements may need to be implemented. Stock standstills may reduce the ability of landholders to move livestock before a chemical is applied.

Farmers may also be concerned about leaving food scraps on the property that can spread disease to livestock or cause animal welfare issues.

Biosecurity exclusion zone – Meredith. Photograph LJ Gervasoni

Safety – withholding periods. OH&S, regulatory.

Agricultural chemicals often have requirements for use – both in the application and restrictions on contact with for a period post their use. Farmers may know not to allow any access to a paddock due this period – but how will other parties know what chemicals were used and the precautions in place.

Farmers with existing transmission lines have asked Ausnet staff what chemicals they just saw them apply to their farm. They are often told to 'F O' and are therefore unable to gauge risk to themselves, their livestock or their crops.

Agriculture Victoria has information on common withholding periods.

Ability to sell produce – withholding periods. OH&S, regulatory, physical.

Farmers need to fill in vendor declarations when they sell produce. These vendor declarations can include knowledge of who was on the farm or what chemicals have been used. If a farmer has not been told that an herbicide has been applied near the powerlines and they declare the chemical has not been used, they may have their whole shipment refused if the chemical shows up in a test sample.

The landholder is also liable for significant penalties for selling produce that is contaminated with unacceptable chemical residues so it is critical that energy companies seek prior consent to the use of any chemical on the easement.

Animal Welfare – withholding periods. OH&S, Financial

Like human safety, the health and wellbeing of livestock can be affected if they are kept in a paddock after a chemical can be applied. The risk of ingesting the chemical is greater for livestock left to graze in that paddock.

Animal welfare – mismothering and stampede. OH&S, regulatory, physical.

There are times of the year when livestock can be disturbed. Access by land or air without precautions can lead livestock to flee – which can cause injury. Stressed livestock can lead to spontaneous abortion or the desertion of offspring. Livestock can charge humans when approached by strangers or are startled. Contact with offspring can change scent leading to abandonment. In the case of solar panels spooked livestock can be injured by interactions with panels.

Animal welfare – interaction with structures. Physical.

Injuries can occur between infrastructure and livestock. Any sharp edges or gaps can lead to cuts and entanglements to livestock. Cattle are prone to using support structures as scratching poles. Fleece or longer haired species can become entangled.

Livestock can be startled by loud noises, including weather events. When spooked this can lead to collisions with infrastructure at speed, with the risk greater in darkness.

Underground drainage and laser levels. Physical. Financial.

Many farms have significant in ground infrastructure (drainage) to ensure crops are not waterlogged in wet conditions or from irrigation. Many farms have also been graded or laser graded to ensure efficient flow of water across the site.

The direction of farming and type of irrigation able to be used is dictated by the underground drainage. A transmission line that requires a change in irrigation type can require the complete replacement of drainage (two-year impact on production) with broader impacts where the direction of planting is altered. Long runs will then become short runs and the likelihood of some areas being taken out of production.

Underground drainage can be significantly impacted by footings leading to changed flows of water.

Construction and footings can change levels. Even a millimetre or 2 can impact on the efficiency of a laser graded paddock.

Soil compaction and health. Physical, financial.

Energy companies often have little understanding of soil health and the importance of this to farming systems. Agriculture Victoria information on soils that demonstrate that rehabilitating soils is more than filling a hole.

Soil fertility stems from an interplay of soil structure (type of top and subsoils) and texture; soil biota; and soil ph and sodicity. Farmers actively manage their soils – to increase organic matter, to ensure friability, to encourage healthy biota and to reduce risks from waterlogging, erosion or compaction.

It is common for farmers to spend generations working on improving their soil health. This can include minimising vehicle access by using defined paths. Construction vehicles such as bulldozers and concrete trucks can lead to significant compaction of the soil that can take decades to reverse.

Concrete footings replace soil and change soil conditions that can impact on soil health. Rehabilitation plans rarely address how footings will be removed.

Tramline changes due to vegetation or linear in ground infrastructure across a paddock. Source Google maps

Reduced cropping at base of Portland line (landholders not informed of Ausnet's policy). Image Google Maps.

Irrigation. Physical, regulatory, financial.

Irrigation is a significant tool in many production systems. Irrigation can be via a formal irrigation district (public infrastructure), such as Bacchus Marsh, Shepparton or the Macallister. Irrigation can also be direct access to groundwater, rivers or dams, such as in the red ferrosols around Ballarat or dairy production in South West Victoria.

The ability to use irrigation systems can be impacted by drainage and landform and layout. A change of irrigation due to transmission may mean that a paddock that has been drained for east – west furrows will now need to be farmed in a north – south furrow. This will require the total replacement of drainage and can lead to inefficient layouts.

Examples of east – west and north-south furrows based on sub surface drainage. Source – Google maps

Irrigation systems are often multi bay units that use may be obstructed by pylons. Some systems are several hundred metres in length. Some irrigators have an end of system gun.

Single bay lateral move sprinkler irrigator without gun. Source LJ Gervasoni

Gun irrigation systems are common in western Victoria. These expel a stream of water from a single point.

Gun irrigation at Blampied. Source LJ Gervasoni

Attachment 2 provides additional detail on irrigation systems.

Limitation to structures

Some renewable energy and transmission projects create confusion over a range of structures, including fencing. Guidance allows timber paling fences but restricts farm fencing- wood post and metal wire. Earthing is required for this fencing which is well below the 5m safety clear zone.

It is common for landscape and flood overlays to require open post and rail fencing.

Fencing is critical to livestock production systems. Fencing is likely to be required for transmission lines given current interpretation of Energy Safety regulations and the priority to provide safe workplaces.

In response to climate change the use of structures as shade and shelter is becoming more prevalent in animal production.

Structural integrity and fire Physical, Regulatory, OH&S

Wind turbines can shed blades or attachments to blades. These can fly several hundreds of metres and represent a physical threat to humans, livestock and structures. The material can cause a hazard if obscured by pasture or crop to livestock, humans and to machinery, including on neighbouring properties. Wind turbine fires are a concern for surrounding landholders, especially if occur during high fire risk periods.

Wind turbine attachment embedded in paddock and crumbled metal during construction of Golden Plains Wind Farm – photo Russell Coad.

Firefighters' attempts to control the blaze were considered ineffective. *(Supplied: Maddison Makeham)*

Wind Turbine fire – winter. Portland.

V. Attachment 2 Transmission lines and irrigation

Irrigation type is chosen to suit the nature of the farm (size, shape and topography) and the type of production. Irrigation requires in ground or channel drainage. Changing the type of irrigation can require significant changes to drainage system and farmed area.

Types of Irrigation Systems

Centre pivot and Lateral Move

- Irrigation system used for many crops and pastures. Uses a sprinkler system which is appropriate for crops that need regular watering.

Centre pivot systems have a series of wheeled towers, typically anchored at the centre of the field, with sprinklers or drip lines mounted on the moving structure. As the pivot rotates around its central point, it evenly waters the crops in a circular or semi-circular pattern.

Centre pivot irrigation – Source Google Earth

Centre pivot and lateral move systems consist of the following components:

- span is the pipe and framework between two towers
- tower supports the spans and contains drive mechanisms and wheels
- outlets are the points at which water exits the main pipes

- emitters are attached at outlets either directly or on rigid or flexible droppers — (water is applied to the plants through emitters)
- droppers are rigid or flexible small diameter pipes that allow emitters to be placed closer to the ground.
- Farm drainage and furrows are designed around the irrigation infrastructure in place. Changing systems can have farm wide implications.

Land area: A typical centre pivot system in the Shepparton Irrigation Region (SIR) has a span of 300 to 400 meters long and irrigates 28 to 50ha. However, they can be as short as a single-span 35 meter unit or as long as 800 meters with 18 to 20 towers irrigating approximately 200ha.

However, the large systems have high average application rates at the outside of the circle that may exceed the infiltration rate of the soil and consequently cause run-off.

- **Land shape:** Centre pivot systems irrigate a circle, which covers 78% of a square. This can be an issue on dairy farms with limited available land. End guns used on centre pivots to irrigate square properties are not recommended (see below). Lateral move systems can be an option to irrigate rectangular areas, but cannot divert around structures (towers or trees).
- **Land slope:** Centre pivots can irrigate significantly undulating land. Some minor earthmoving may be needed to connect depression areas and provide drainage for runoff from rainfall events. In some cases, where the development of border check irrigation would require significant cut and fill, the cost per hectare of installing a centre pivot can be lower than border-check irrigation.
- **Soil type:** Centre pivots are able to irrigate any soil type. However, sprinklers should be selected to suit soil infiltration characteristics, as excessive average application rates can cause runoff. It is desirable the pivot irrigates one soil type or soil types with similar infiltration characteristics.

Lateral move

Lateral move systems share similar technology to pivots and are suited to large rectangular areas — up to 200 ha. Lateral move irrigation is favoured for large paddocks are the laterals move continuously along the field's length and covers 98% of the paddock.

Laser Grading

Irrigated and non irrigated areas may be laser graded to gain most efficient crop and pasture production from irrigation or rain events.

Even a few millimetre change in land grade can disrupt the optimal operation. Foundations and soil compaction from roads or construction can impact the effectiveness of production.

Spray Gun

Can be at the end of a lateral or on its own. Commonly used for crops such as potatoes – less compaction of soil. Expels water at height and distance.

Flood Irrigation

Flood irrigation is the method of distributing water over an entire field at one time and is common in irrigation districts where small, fragile plants like lettuce or spinach are grown, or dairy systems for pasture. It delivers consistent amounts of water without damage from waterlogging.

This method is used on small areas that don't need to be subdivided into sections or zones (like lateral systems do), but instead are covered by one large sprinkler head or series of sprinkler heads.

VI. Attachment 3 agriculture impact considerations for inclusion in approvals processes

Wind and Solar Energy and Farming

Learnings from wind energy

- Companies do not explain the width and level of compaction of access tracks that lead to significant impacts on production that negate payments.
- Companies do not include easements for power in information to landholders. These can have significant impacts on operation.
- Easements need to be specific to the proposal and should not be transferred to other bodies.
- The planning process often fails to identify airstrips and agricultural low altitude operations.
- Insurance to operate agriculture low air operations within 1 .5km of a wind turbine is difficult to obtain leading to 5 to 6 figure increases in annual costs to spray etc (including to neighbours)
- Require biosecurity washdown areas.

Learnings for solar energy

- Opportunities for grazing / shelter for sheep
- Proponents need to design systems for co-existence with cattle and other livestock
- Not compatible with cropping (machinery size)
- Agrivoltaics could be possible for some horticulture with design for height and width of machinery or vegetation.

Learnings from transmission

- There has been significant failure of Transmission Companies in relation to understanding the operational arrangements promised at acquisition at easement.
- There is no access code for existing transmission lines or regulatory oversight of TNSPs.
- The Electricity Industry Act does not ensure that companies access land within an acceptable regime.
- Energy regulators and transmission companies have not informed landholders of changes to rules, nor have they involved landholders in their development.
- Restrictions on height of machinery, irrigation, GPS and drone use and aerial operations have significant impact on farm operations.
- Guidance and information to landholders regarding fire operations and general safety under lines when there is smoke is not fit for need.
- Transmission companies are dismissive of landholder complaints or identification of impact on production.
- Transmission corridor planning in Victoria has not considered any on farm / production issues in route alignment.
- Some Transmission projects in Victoria have been developed with no active engagement with landholders.
- Rit-t and Multi criteria analysis criteria have not properly assessed agricultural impacts.
- Guidance on compensation has failed to consider ongoing impacts.

VII. Attachment 4 Examples of conflicting and confusing guidance from TNSPs (TCV and Ausnet)

Stubble burning

VNI west prohibits stubble burning. Ausnet allows it with a safety assessment (15 working days). What are the parameters that may make this unsafe? How can a safety assessment be expedited?

By prohibiting stubble burning TCV is effectively ensuring a crop cannot be grown in the vicinity of the easement as stubble burning is a necessary tool to manage disease and vermin, or when stubble is thick.

Drones

Ausnet allows allowed with a safety assessment – what are the key considerations? Ausnet use drones to check lines – so is it a safety issue or an operational training issue?
TCV prohibits all drones within the easement. Some livestock businesses avoid the use of drones seasonally due to the potential to spook cattle with safety and welfare impacts.
Drones are becoming a key tool in grains production systems production, safety and environmental benefits.

Irrigation

Ausnet allows boom and lateral irrigation to 5m with a safety assessment. What are the key considerations? Farms are developed around irrigation systems and a change in system can mean a change in irrigation system means replacement of all subsurface drainage and altering furrows which impacts the whole farm and often reduces productive areas as the system was chosen to suit the physical parameters of the property.

Height of crops

Limit to 3m. Corn can grow to 3.5m. What is the safety risk when machinery can be 5m in height?

Farm fencing

Farm fencing is predominantly metal. There are varying rules regarding the use of this material and the need / location of earthing. What is the risk? Should farmers be expected to bear additional costs to make essential infrastructure such as fences safe or should that be the requirement of the energy company?

GPS

There are two types of GPS used however information about operational impacts are generic. Some companies state that there is interference near the assets in certain circumstances. GPS agriculture is needed to reduce emissions intensity and to minimise stubble burning. Even being off by 1cm may mean the herbicide being applied to the crop rather than the weed.

Height of machinery

Some guidelines restrict machinery to 5m where most of the farm equipment in use is higher than that. There is confusion over grain bins. The bin might be under 5m empty, but with crop in the bin over 5 metres. If machinery such as a boom spray hits a rut on one side the opposite boom spray raises. Ruts could be caused by companies accessing the farm in wet weather.

Aerial operations

Ausnet prohibits air operations within 45 metres of wires which is then likely to extend outside of the easement. Fire bombers are allowed within this buffer but not polair, or air ambulance. TCV says no aircraft within the easement. What is the height of the easement? Has separate rules for firefighting.

Aerial operations are critical to many farms, including for weed management. In some instances, the cost of using aircraft will increase as short runs rather than long runs are required. These restrictions can impact on neighbouring properties. CASA regulations may allow flight near wind towers, however insurance to pilots is prohibitive within a kilometre of the turbine. This can increase costs by over $70,000 per annum without compensation.

VIII. Attachment 5 – description of physical impacts.

Footprint of wind turbines and access areas

Farmers have commercial consent in relation to wind turbine location on their property. There are instances where turbine location can lead to impact on neighbouring properties.

As wind turbines increase in height there can be an increase in the footprint of the pad under the turbine and to the level of compaction required on access road.

The construction pad below is 70m x 40m base area which is 0.28 of a hectare per turbine. Aerial images show a physical impact beyond the pad and road surface.

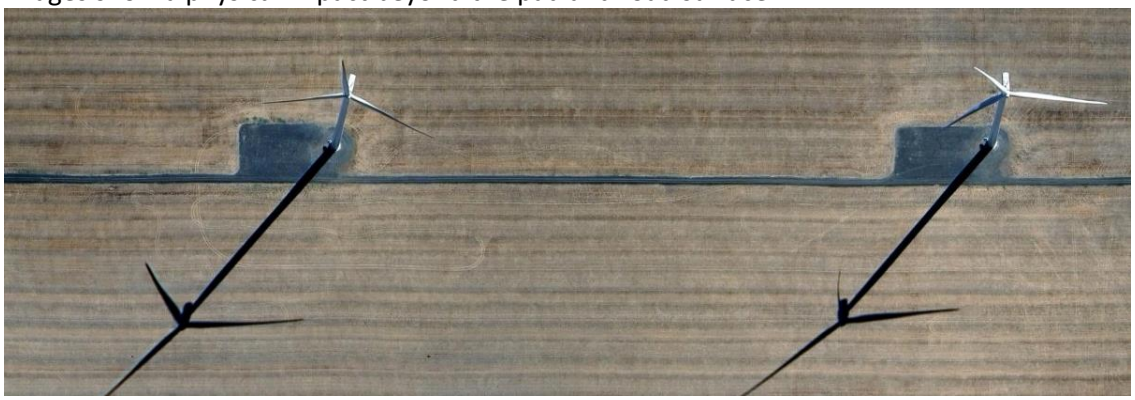


Image Google maps

The area of two 70m x 40m towers is 0.56 hectares. The roadway has a 30m wide compacted areas and a length between the two turbines of
30m wide road compaction x 420 metres between 2 turbines of 1.26ha.
The total land area not available to production is 1.82 hectares.

This land area demonstrates why commodities such as dairy or horticulture that have a higher return per hectare are unlikely to see a financial benefit in hosting wind turbines.

Image Google maps

Footprint of transmission lines

Energy companies often state that there are no impacts on production from hosting transmission lines. The VFF has looked at existing transmission lines and the statements made by SECV when acquiring easement access decades prior to the advent of Energy Safe Victoria. Transmission lines were built over dams and farmers were told the only things they could not do were to plant trees or build structures. No impact on use of planes, tractors and other machinery or irrigation.

ESV and Ausnet have failed to involve farmers in revision to energy regulations or TNSP guidelines. In most cases these have not been provided to landholders.

When examining the Portland Transmission line there are a range of responses including:

- Fencing off transmission lines to exclude from cropping

Google maps

- Cropping to the base of the structures (1980 rules)

Google Maps

- Transmission line and waterway leading to lost production on fertile riverflats and ability to allow regeneration of riparian vegetation.

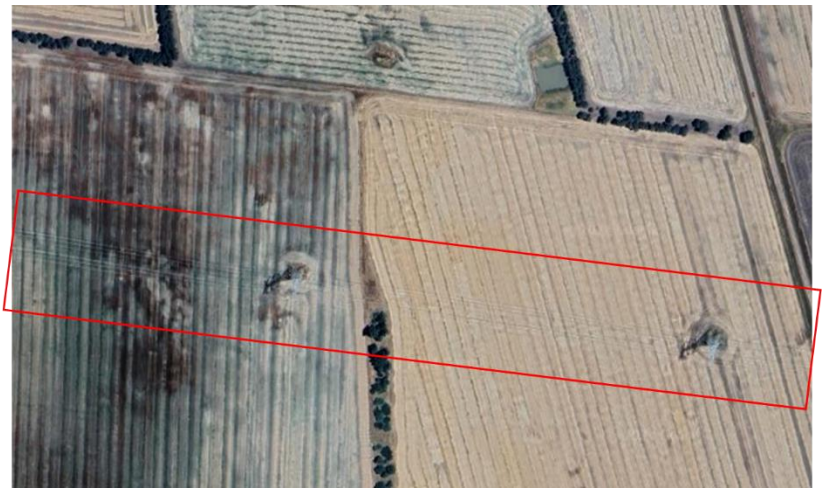
Google Maps

It is likely that farmers under existing transmission lines may have to alter their farming practices to meet the TNSP requirements which are more restrictive than the Energy Safe regulations.

Restricting machinery uses / requiring permits will lead to the potential inability to crop in the red box and impact on the efficient runs and direction of furrowing due to location of the transmission line in the paddock.
If a farmer needed to fence off the area of easement indicated by the red line below, then the area of land in the north of the paddock is unlikely to be cropped, especially if in separate ownerships.

500 x 100 m between pylons (5ha). Total area in easement across two paddocks 10hectares. Easement and sterilised land is 700wide. Length of easement is 1000.

Area not able to be cropped is 70ha.



As there were no restriction on tractor use and as drones and GPS agriculture were not used in farming the Portland Transmission Line alignment did not consider impacts of the route alignment on farm operations.

Under the current TNSP guidelines the alignment below would make cropping inefficient. Farmers have not been compensated for these impacts.

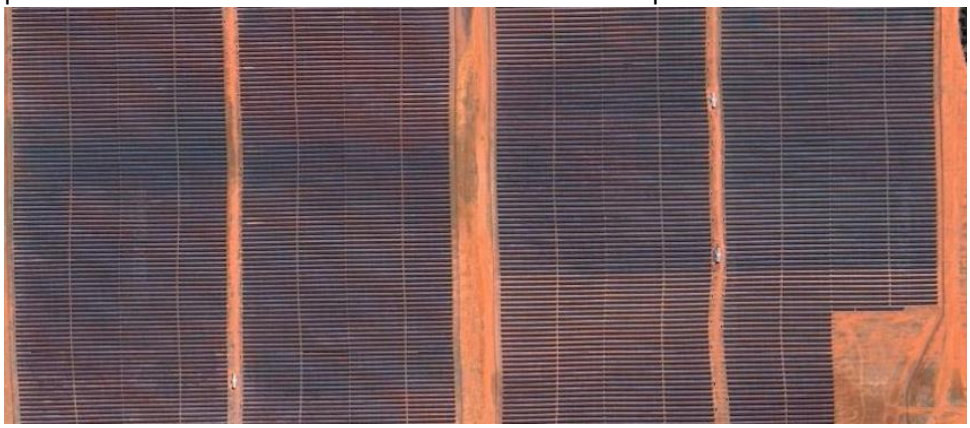
The image below shows red soils near Portland. As no restrictions on activities were discussed during easement acquisition horticulture production continues. It is likely that the farmer is not aware of the rules introduced by private company without discussion with the landholders may expose farmers to safety breaches from their current practices.

Maintenance activities can have impact on farm operations through additional road construction and compacted base areas for machinery uses.

Google maps

Solar

Traditional solar alignments are not generally compatible with crop or pasture (hay, silage) production. Tractors cannot be used in the area under panels.



Total width 850m Bay width 90m Narrow track width 10m. Wide track width 40m
Trials are being undertaken for horticulture under solar panels. This would result in the need to utilise smaller scale machinery than used in Australia and would have broader restrictions. Agriculture Victoria are undertaking a pilot project in Tatura.

 Solar for horticulture – taller structures, less cover, limited size of machinery.
4.5ha vineyard in France https://www.pv-magazine-australia.com/2023/11/01/agrivoltaics-and-the-art-of-farming-under-cover/

Belgian University KU Leuven has a pilot project underway pairing PV