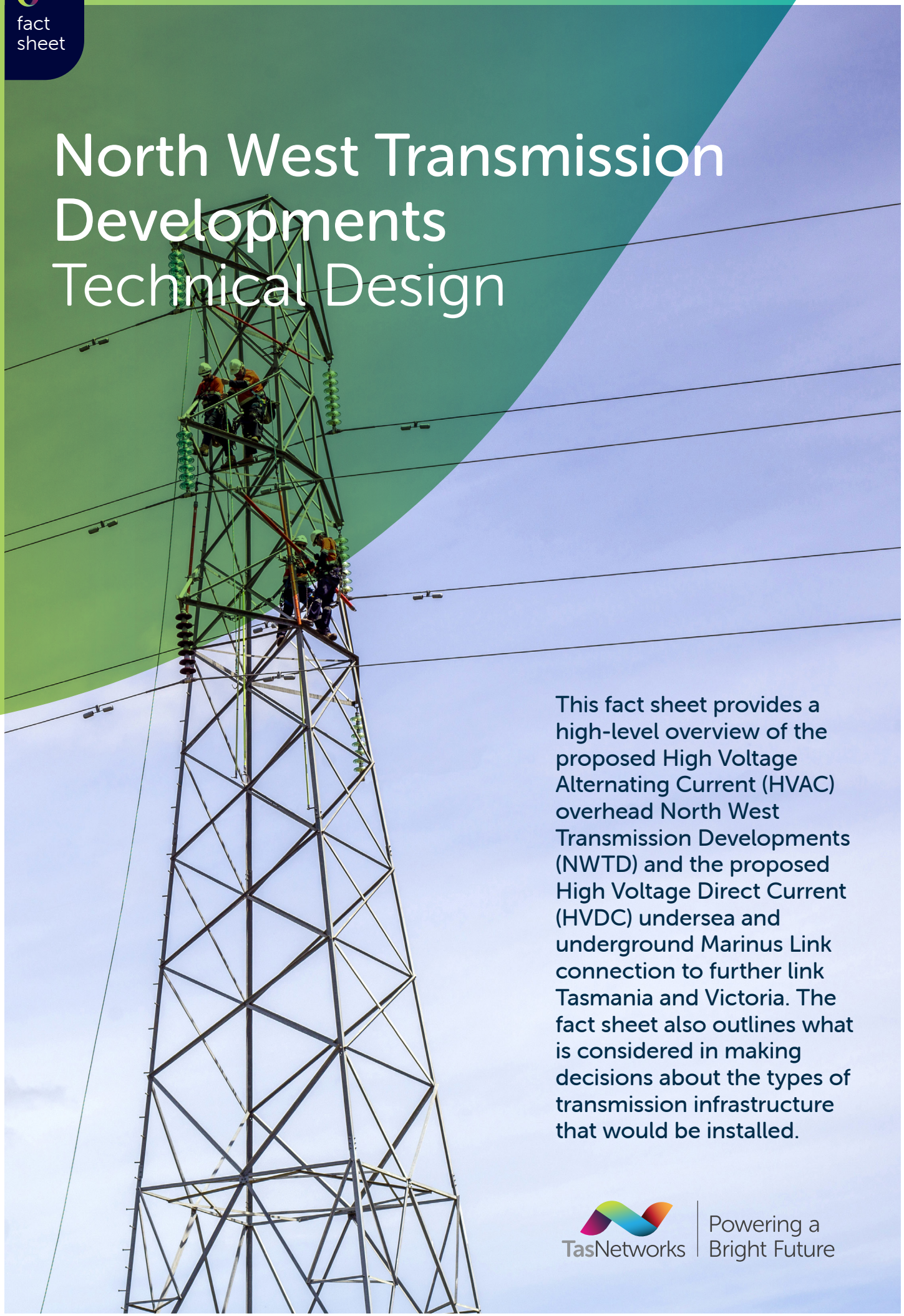
fact sheet

North West Transmission Developments
Technical Design



This fact sheet provides a high-level overview of the proposed High Voltage Alternating Current (HVAC) overhead North West Transmission Developments (NWTD) and the proposed High Voltage Direct Current (HVDC) undersea and underground Marinus Link connection to further link Tasmania and Victoria. The fact sheet also outlines what is considered in making decisions about the types of transmission infrastructure that would be installed.

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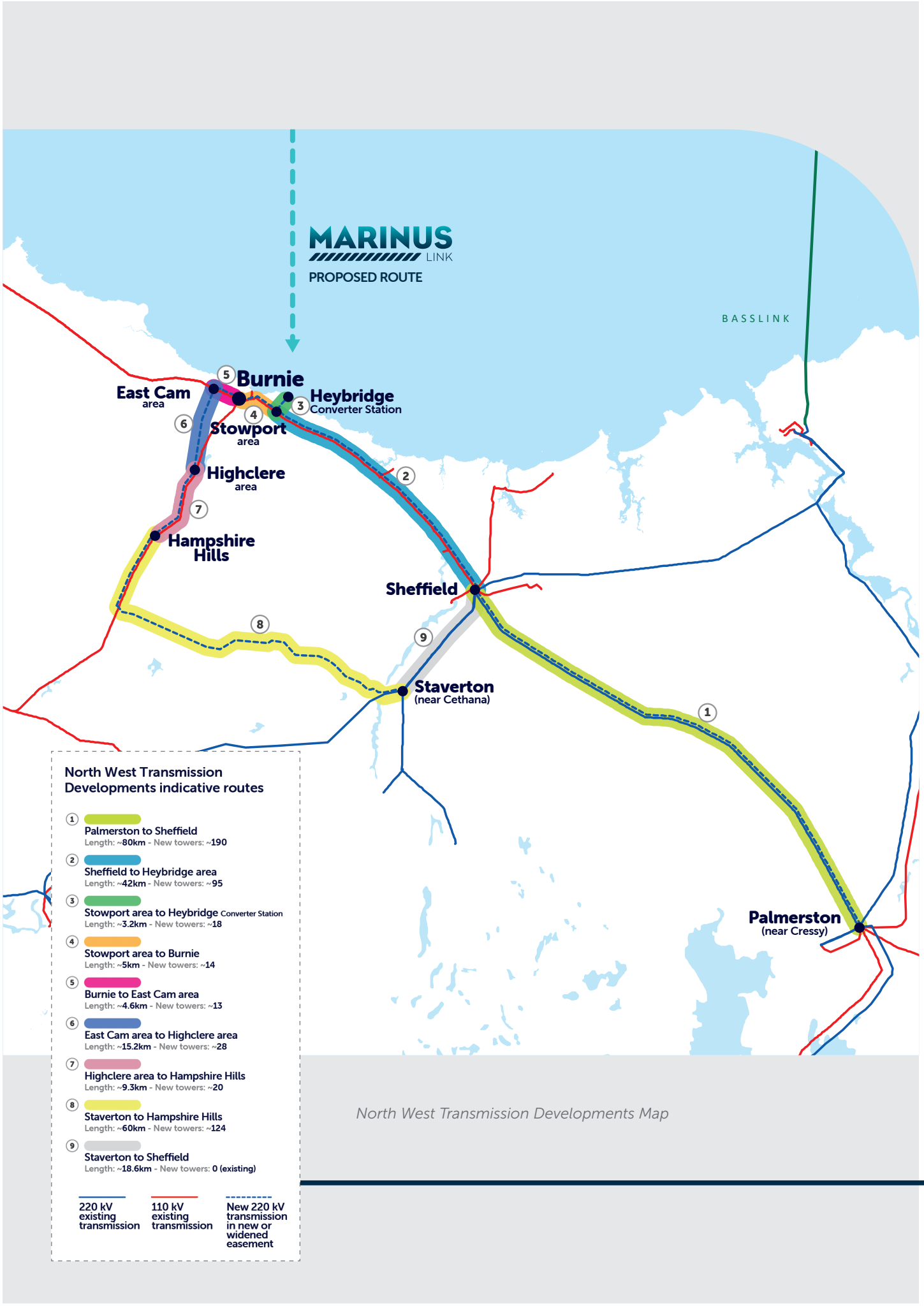
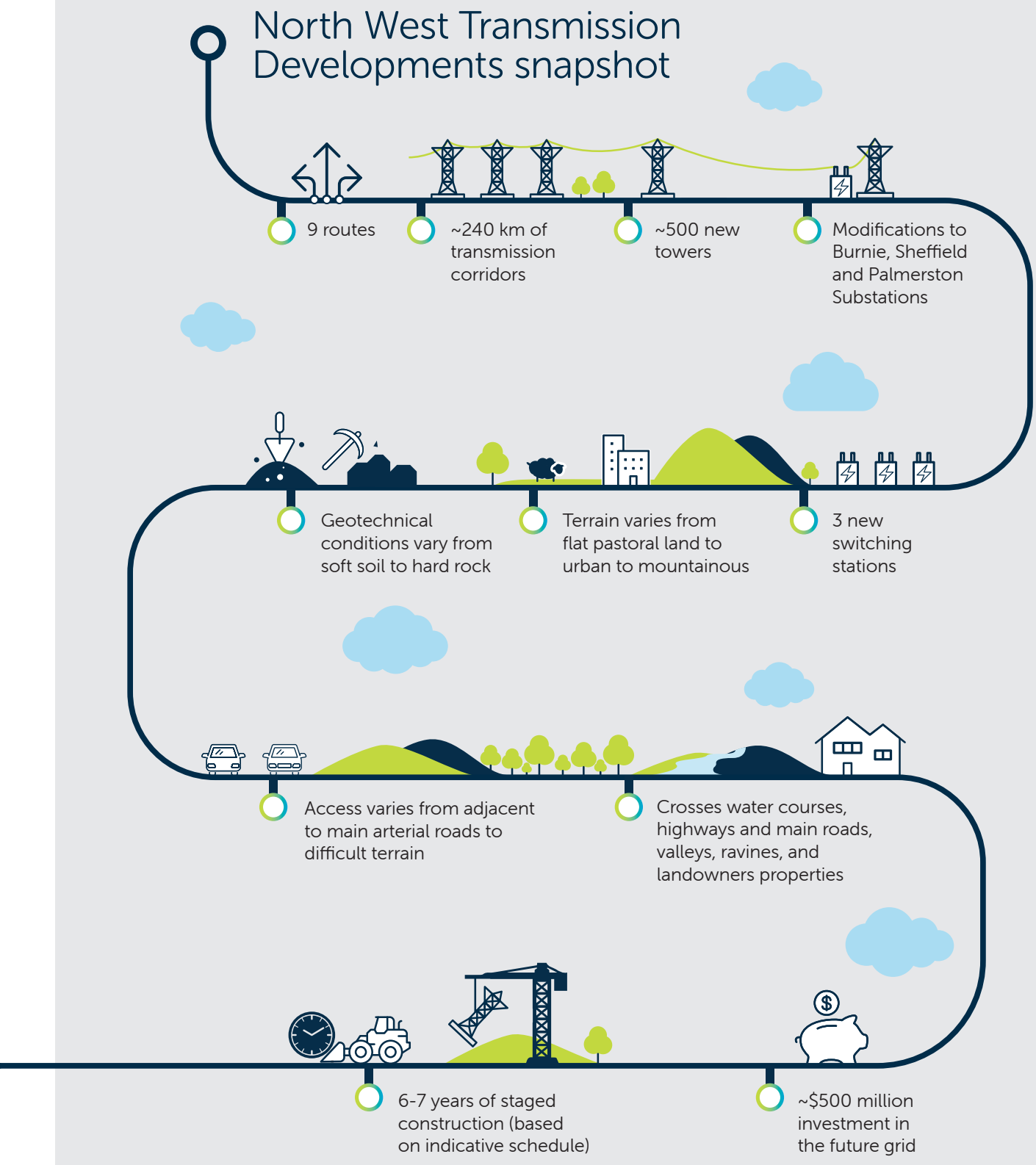


North West Transmission Developments Map

Supporting HVAC North West Transmission Developments, the backbone of the Network



Why can't the North West Transmission Developments be built underground?

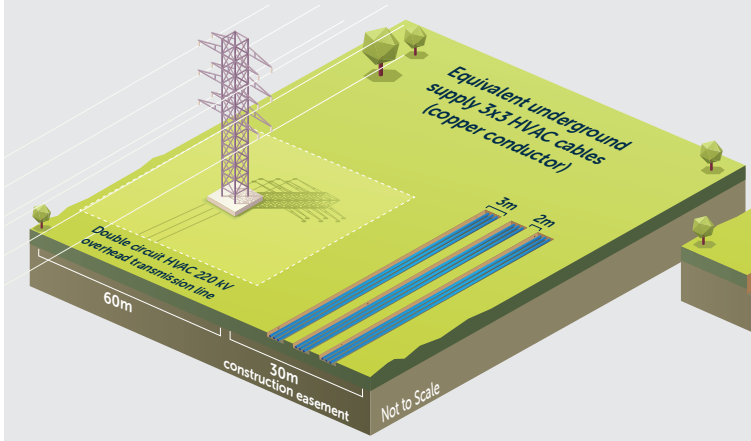
The proposed North West Transmission Developments are needed to strengthen TasNetworks' existing 220 kV overhead High Voltage Alternating Current (HVAC) 'backbone' transmission network.

Underground HVAC cables are not proposed as part of the North West Transmission Developments primarily because it would result in much longer construction timeframes (2-3 times longer) and significantly increased cost (7-10 times more expensive), due to the highly complex nature of underground cable manufacturing and construction.

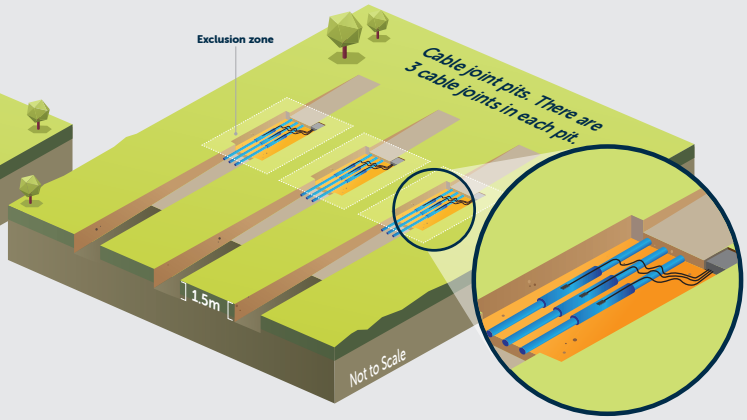
Underground cables can also cause greater impacts to landowners and the environment due to the need to dig trenches to bury cables. 220 kV underground cables require compensation stations every 30-40 km along the route. These are significant above ground compounds and add further cost.

Underground HVAC is not feasible in Tasmania because:

- It takes much longer to construct;
- It is 7-10 times more expensive to construct;
- There are still impacts to landowners like farmers;
- Specialist skills sets are needed from mainland/internationally;
- There are greater environmental impacts from vegetation clearance and trenching;
- It is harder to find and repair faults on underground assets.



If a cable with an aluminium conductor is chosen, four trenches with three cables in each are required because copper is more conductive than aluminium.



Cable joints are required every 1km. This is because standard HVAC cable drums carry max 1km lengths.

Cost

Underground HVAC cables are significantly more expensive than overhead HVAC transmission lines (7-10 times depending on power rating and terrain) and are typically only considered where overhead transmission are unable to be constructed. Keeping costs low is in the interests of all electricity customers.

North West Transmission Developments Technical Design

Impacts to farmers

Overhead transmission lines can impact some farming operations such as use of pivot irrigators. However, underground HVAC would still require easements (30m wide construction easement throughout) together with significant trenching (3-4 trenches) to house 9-12 large cables (depending on conductor type) and above ground infrastructure such as joint bay access points and compensation station compounds along the route.

Longer and more complex construction phase

Undergrounding HVAC would require longer construction time (2-3 times longer), increasing landowner disruptions. It would also require specialist skill sets that are not available in Tasmania, so specialists would likely need to be sourced from mainland Australia and internationally.

Greater environmental impact

Undergrounding HVAC can have greater environmental impacts as easements need to be fully cleared in a contiguous way, where overhead transmission allows for ground clearance that can avoid some vegetation removal (e.g. in sensitive riparian areas, grassland areas and valley environments etc.).

Restoring faults

Undergrounding HVAC can have a number of technical constraints including the ability to efficiently find and repair faults on a cable that is buried in the ground.

Customer connections

HVAC is required to connect new generation and loads, and to make these connections to underground assets is costly and increases technical constraints/risks. The North West Transmission Developments need to service an increasing number of generation and load customers that want to connect to the grid including, wind and solar farms, data centres and hydrogen plants.

Why is Marinus going underground in Victoria?

Marinus Link is a point to point connection across Bass Strait with a total length of over 300km. Very long HVAC cables are impractical and so HVDC is the only technology choice available. Extending the HVDC on land in Victoria using overhead lines would be technically complex and expensive and so underground cables are the most economic solution all the way to the Latrobe Valley.

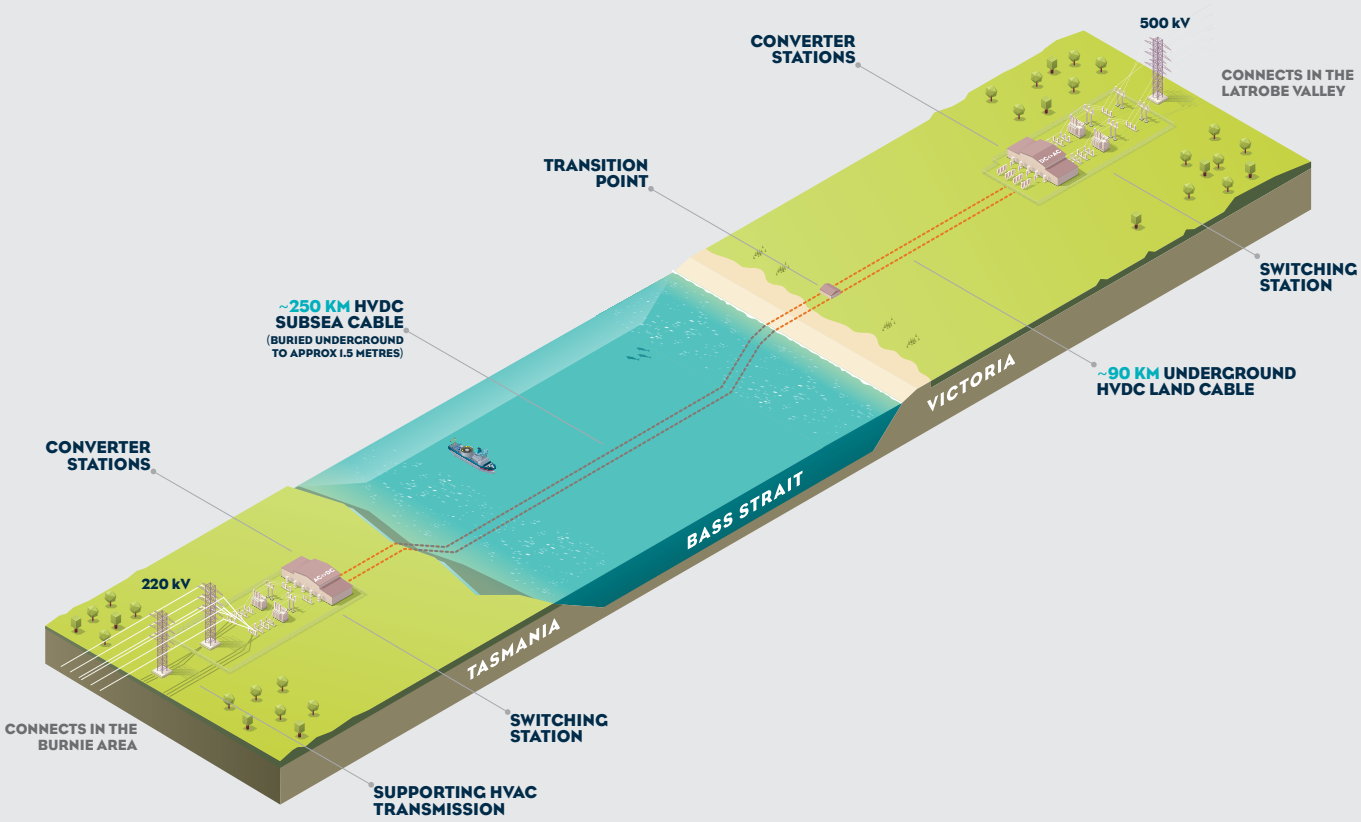
There are key differences between HVAC and HVDC when it comes to choosing the right cable technology.

HVDC is the only viable choice to cross Bass Strait

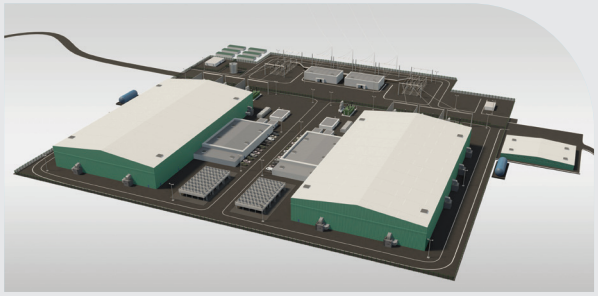
HVDC is the most efficient, effective and safe way to transfer bulk energy point-to-point across long distances such as Bass Strait. For Marinus Link that's a 255km marine crossing from Burnie to Waratah Bay and a 90km land crossing to join into the 500 kV HVAC transmission network at the Latrobe Valley, Victoria.

This is because HVDC cable technology;

- Doesn't require "compensation stations" at regular intervals along the route (a requirement of HVAC underground cable design). Compensation stations cannot be built underwater, so HVDC is the only viable cable technology to cross Bass Strait.
- has lower energy loss factors across long distances, compared to HVAC cable technology.



Marinus Link diagram



A pair of converter stations

Fewer cables

HVDC requires fewer cables (three compared to up-to twelve) to transfer the same amount of energy. This means fewer trenches, cable joints and lower material and labour costs, a shorter construction time and a smaller easement width.

HVDC needs converter stations

HVDC needs to be converted to Alternating Current (AC) before it can be used in homes and business, with the existing shared transmission and distribution networks across Australia being predominantly AC networks. A pair of converter stations to convert HVDC to HVAC at each end of the cable can cost up to $500 million. This makes HVDC uneconomic for the interconnected network in Tasmania.

No customer connections along the route

There is no need to connect generation or load customers along the proposed Marinus Link route. This means that having spanned the Bass Strait, in Victoria, Marinus Link can continue underground at HVDC voltages with a converter station in the Latrobe Valley to convert to HVAC voltages.

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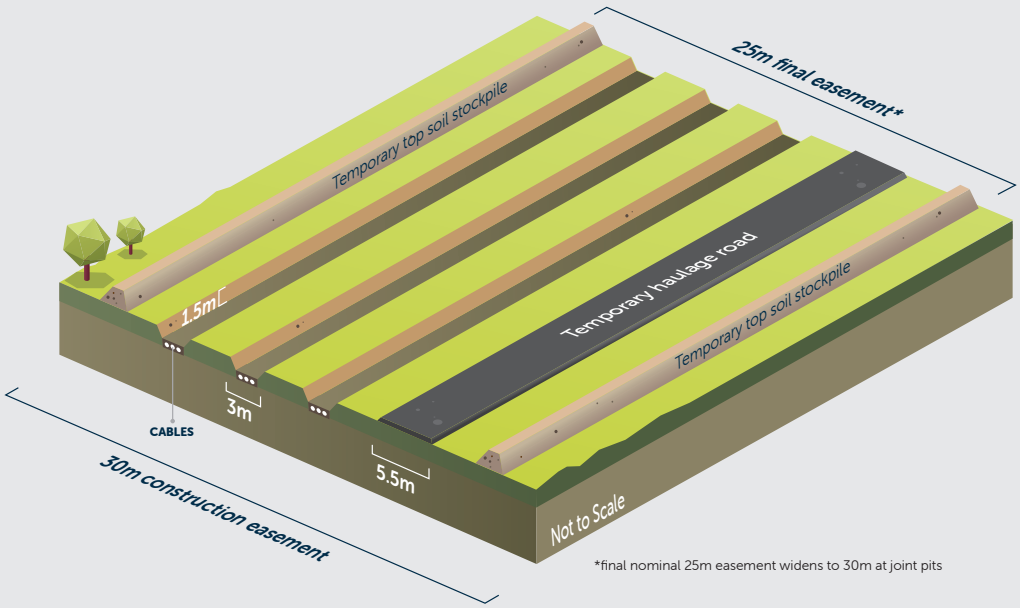

Indicative underground cable design for Palmerston to Sheffield case study (based on nine cables with copper conductors).

Palmerston to Sheffield Case Study

TasNetworks commissioned a detailed study to look into the feasibility of undergrounding one route of the proposed North West Transmission Developments, the section between Palmerston and Sheffield. This route is ~80km long and traverses rural farmland, with terrain that is relatively flat, with favourable geotechnical conditions including soft soils with few rocky outcrops and good access compared to other mountainous and more remote sections of the North West Transmission Developments.

The cost to develop this route underground utilising HVAC cable technologies as an alternative to HVAC overhead transmission infrastructure was estimated to cost 7-8 times more ($1 billon vs $144 million) and take 2.5-3 times longer to construct (5 years vs 1.6 years).

An underground HVDC option is almost 10 times more expensive ($1.4 billion vs $144 million) mainly due to the need to build converter stations at either end of the connection at a cost of up-to $500 million for a pair.

Want to know more or stay informed?

The information in this factsheet is based on expert technical advice provided by Jacobs / JMME. Which is available on the talkwith.tasnetworks website.

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