MARINUS LINK

Delivering low cost, reliable & clean energy

Consumer Advisory Panel | Roundtable #2

Topic: Constructing Marinus Link

3 May 2022

Stephen Clark
Project Director

Acknowledgement of Country

MARINUS LINK

AGENDA

2:00pm	**Meeting Start – Heath Dillon** - Acknowledgement of Country - Introduction - Housekeeping
2:05pm	**Today's purpose – Heath Dillon**
2:10pm	**Constructing Marinus Link – Stephen Clark**
2:50pm	**Q&A- Mandi Davidson**
3:00pm	**Meeting close – Mandi Davidson**

Next roundtable session
The Marinus Link business case with Ben White
Fri 13 May | 2:30pm – 3:30pm

Today's purpose

Heath Dillon, Executive Manager Customer and Revenue

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Constructing Marinus Link

Stephen Clark, Project Director

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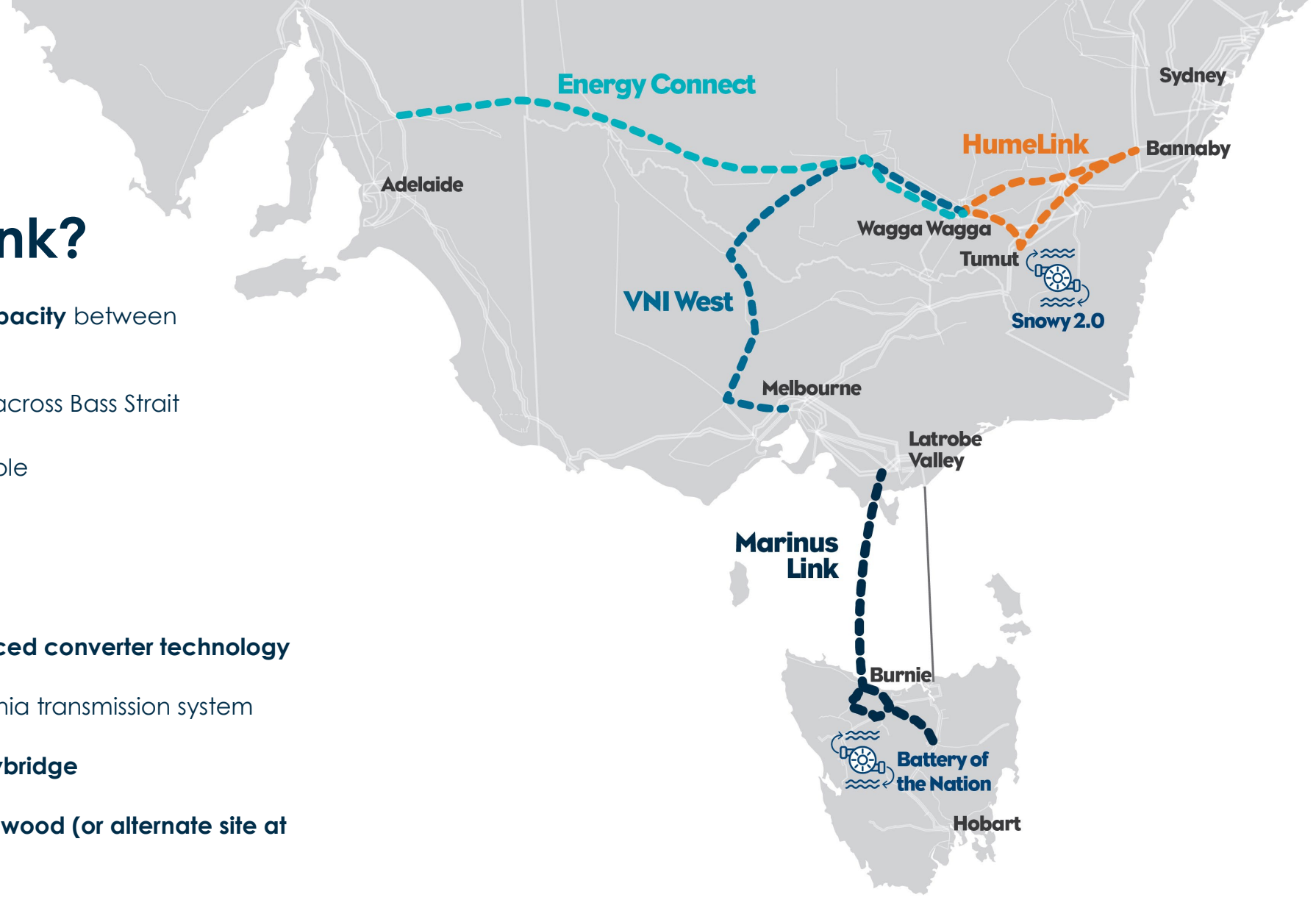
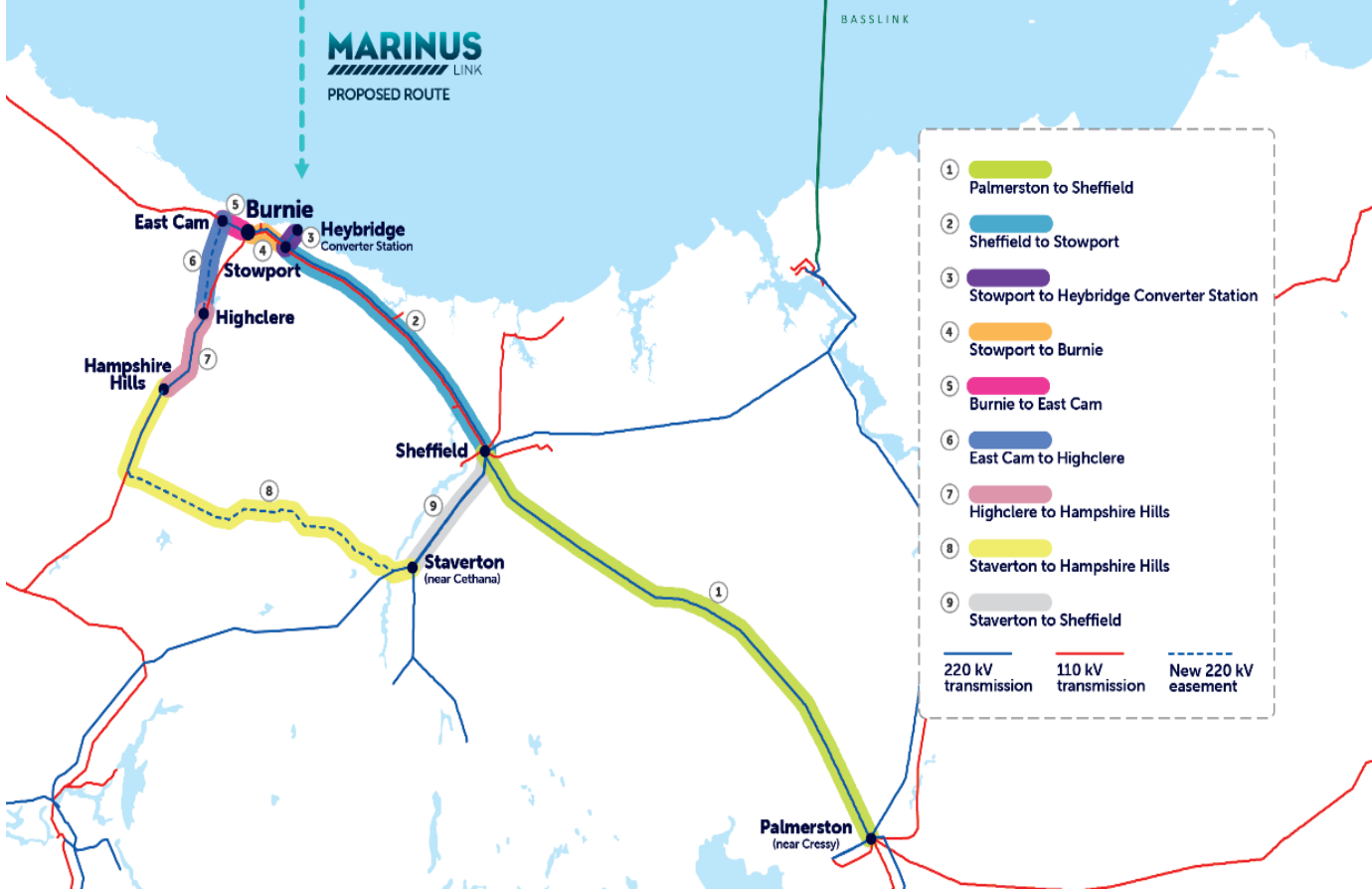
What is Marinus Link?

- **1500 MW of increased transmission capacity** between Tasmania and Victoria
- Increased fibre optic cable capacity across Bass Strait
- **~250km** undersea, ~**90km** on land cable
- +/- 320kV (**2 x 750 MW monopoles**)
- **No DC overhead lines planned**
- Using modular multi level **voltage sourced converter technology**
- Significant upgrades to the AC Tasmania transmission system
- **Tasmanian AC switching station at Heybridge**
- **Victorian AC switching station at Hazelwood (or alternate site at Driffield under consideration)**
- **For RIT-T and ISP purposes,** Marinus Link and North West Tasmanian Transmission Developments (NWTD) are **collectively referred to as the Marinus Link interconnector**



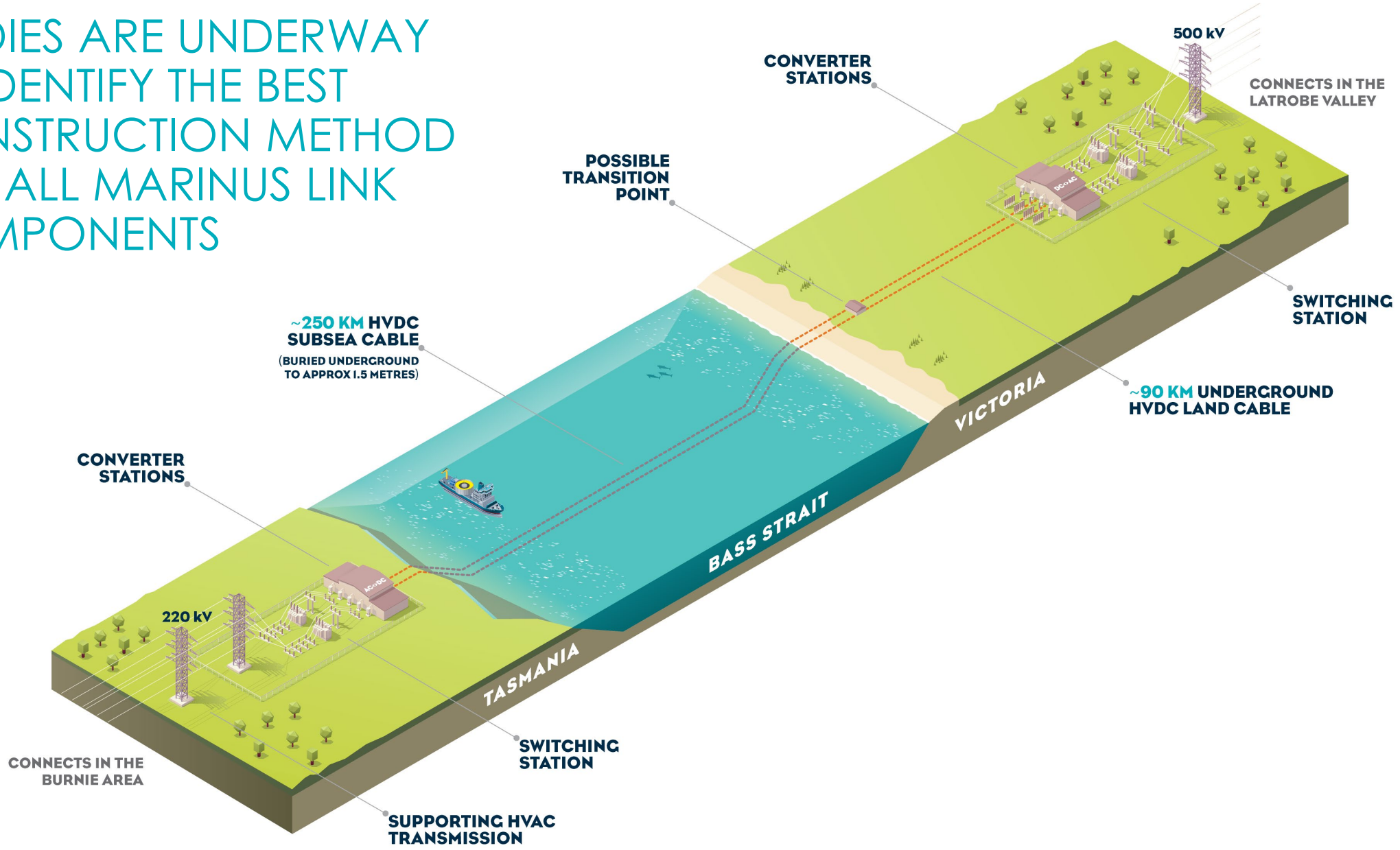
What is North West Transmission Developments?

- **Upgraded and new AC transmission lines in North West Tasmania** including:
  - **double circuit 220 kV 'rectangle'** connecting Sheffield and Burnie substations with new switching stations in Hampshire Hills and Staverton;
  - **New transmission between Sheffield and Palmerston** (near Cressy) and the removal of the existing line.
- The proposed developments are designed to:
  - **unlock the energy potential** identified by AEMO **in** North West and Central **Tasmanian REZs**;
  - **facilitate** connection of **additional energy generation and storage** in Tasmania; and
  - **support energy flows to/from Marinus Link**.

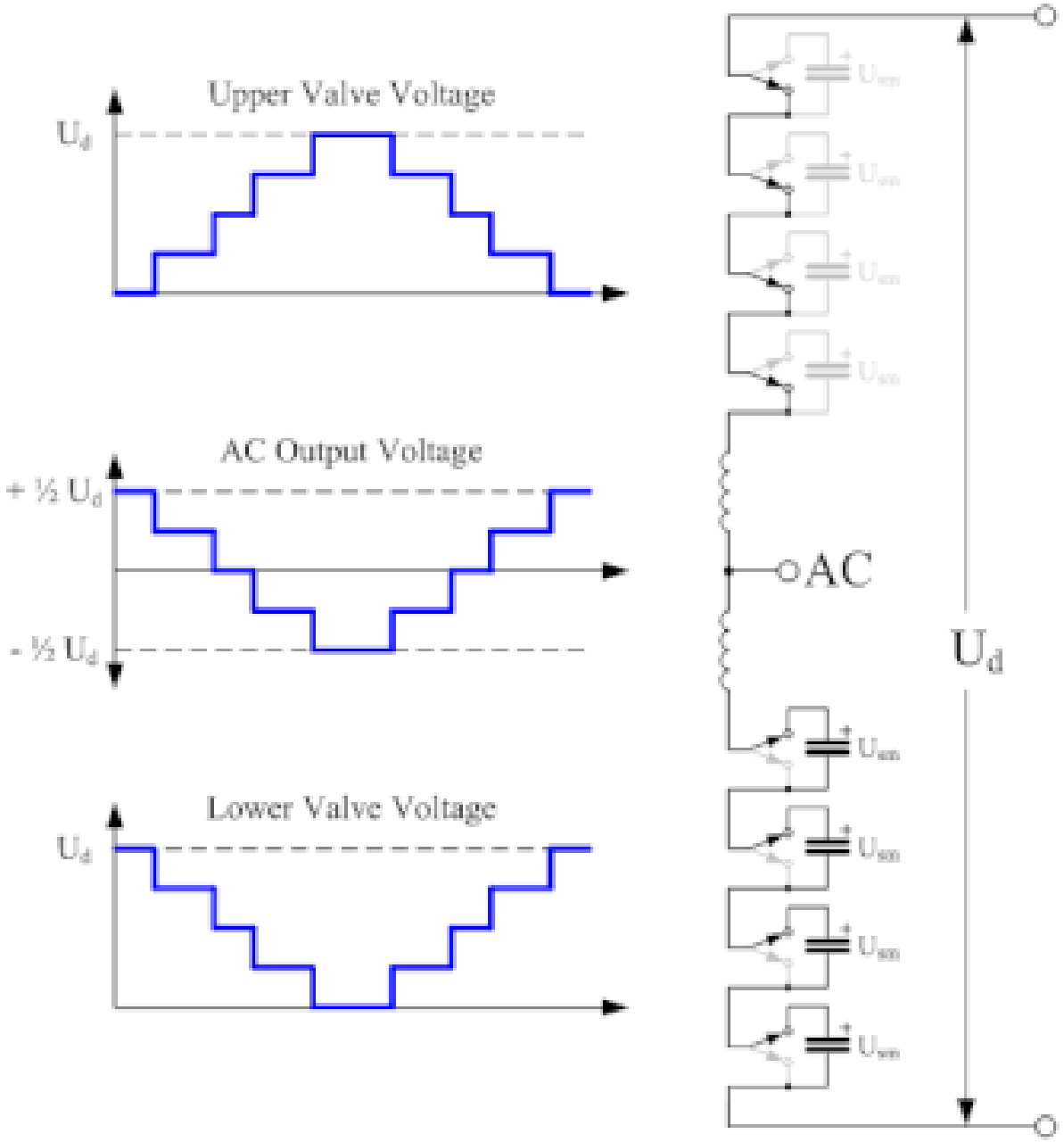


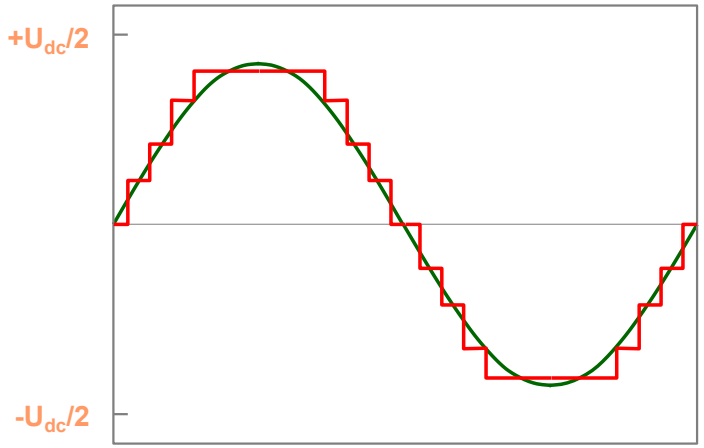
*North West Transmission Developments indicative routes

STUDIES ARE UNDERWAY TO IDENTIFY THE BEST CONSTRUCTION METHOD FOR ALL MARINUS LINK COMPONENTS



HVDC Technology and Converter/Switching Stations

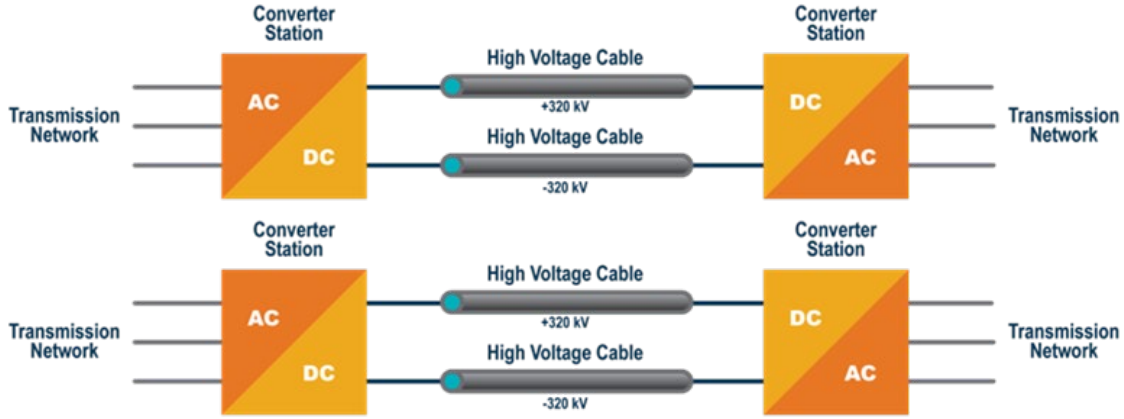

Upper Valve Voltage
U_d
AC Output Voltage
+ ½ U_d
- ½ U_d
Lower Valve Voltage
U_d
AC
U_d
U_{sm}


$+U_{dc}/2$
$-U_{dc}/2$

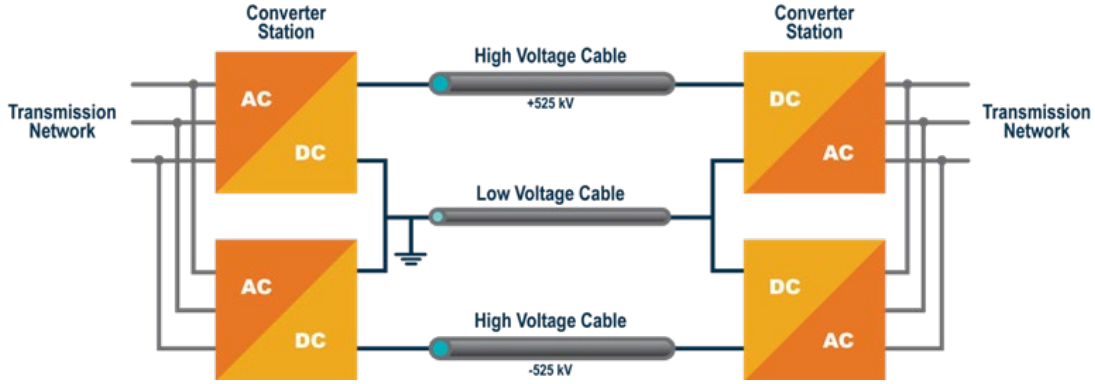
Configuration of link for 1500MW

- Configuration: either 2 x 750MW monopoles or 1 x 1500MW bi-pole.
- Both configurations limit the largest contingency size to 750 MW
- Features of 2 x monopole configuration:
  - - proven technology
  - - provides more security
  - - smaller environmental impact; only two cable trenches in Bass Strait and less EMFs
  - - commissioning can be staged
  - - longer cable manufacturing time

Configuration: 2 x 750MW monopole

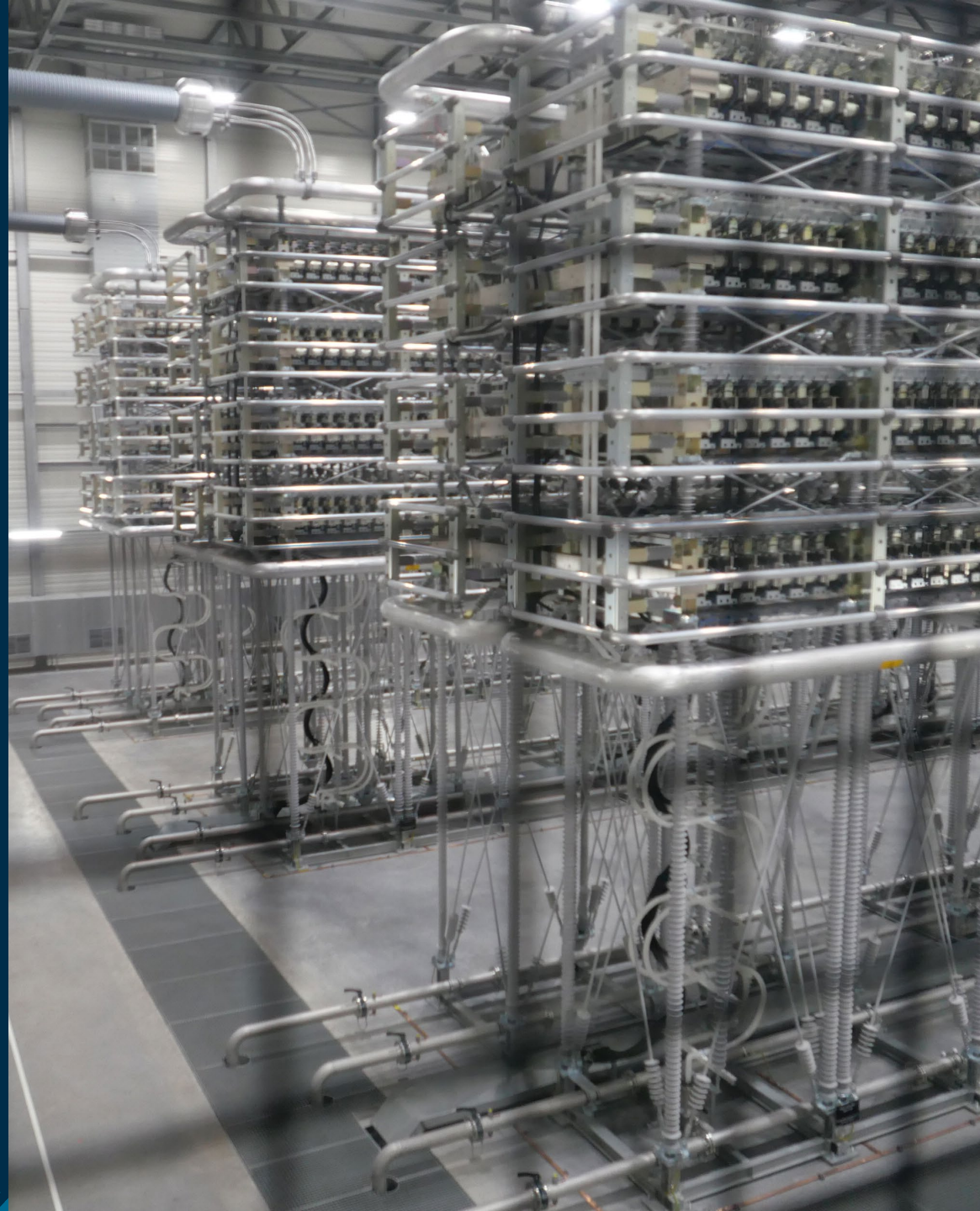


Configuration: 1 x 1500MW bi-pole



VSC HVDC Converters

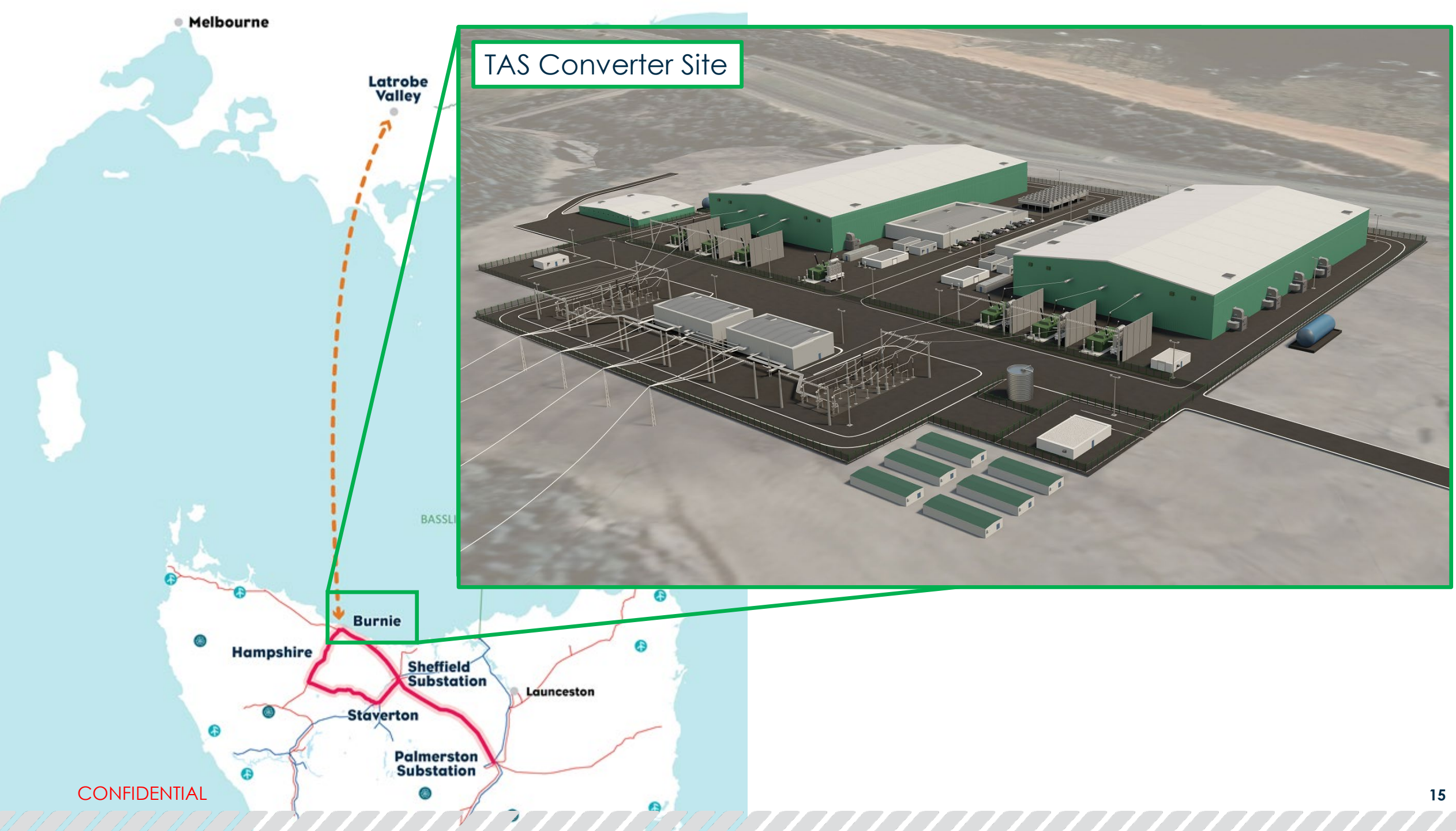
- Fully controllable – no commutation faults, no filters, no dead zone, no transient overvoltage issues, no minimum system strength requirements. P/Q and V/F control modes
- Bi-directional current - fast reversal, can continuously provide frequency control services
- Stabilises the power system during electrical faults – fast recovery after faults
- Almost zero ‘electrical pollution’ in the form of harmonics
- Uni-directional Voltage – multi-terminal, less stress on cable (can use XLPE cable)
- Converter power losses similar to LCC converters
- Can act as a firewall to stability and cascading failures

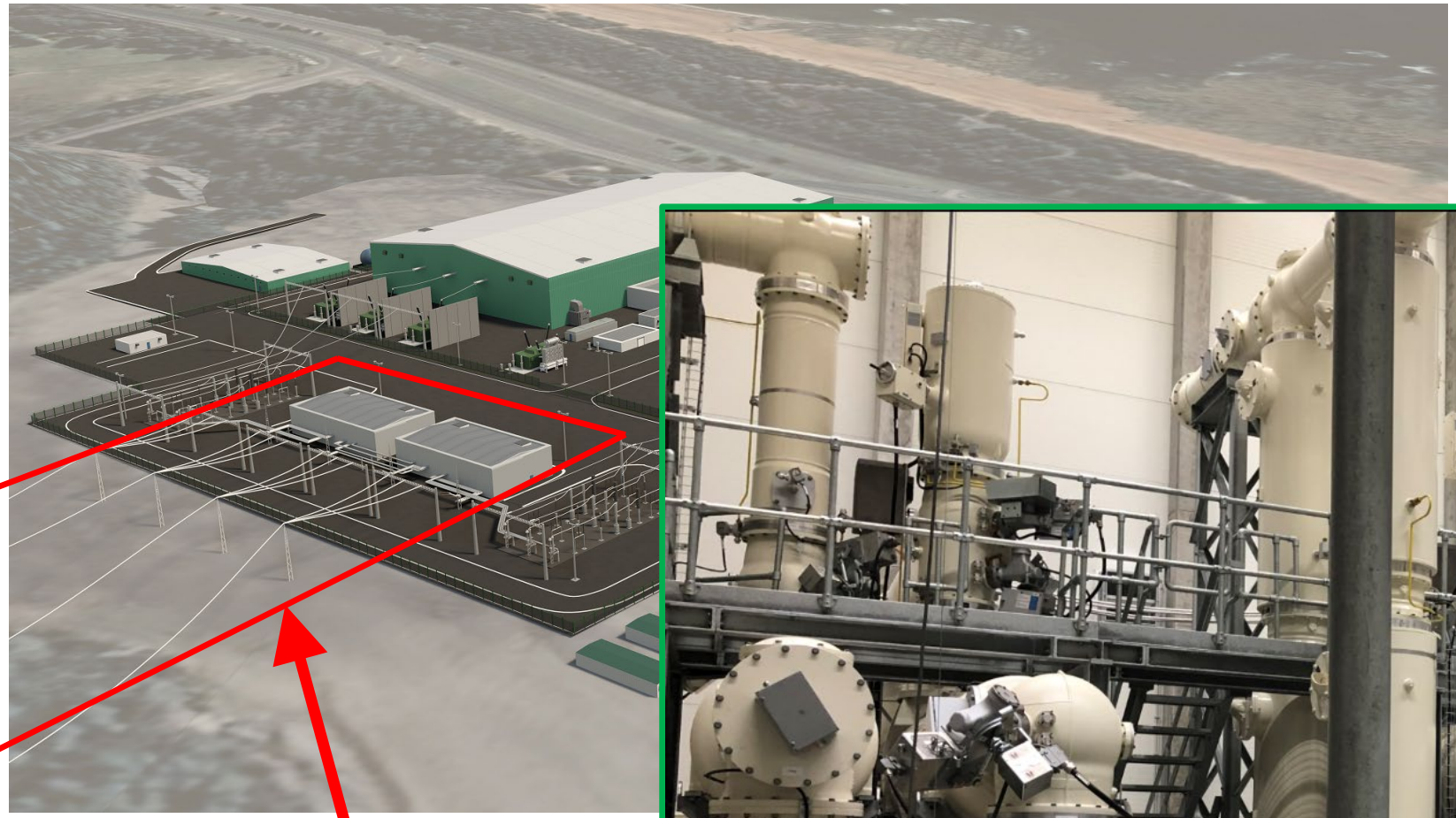


Inside Nordlink – 1400 MW bi-pole 500km long cable

NordBalt 700MW Symmetrical Monopole

- 400 km Marine & 40 km land XLPE Al cable 300kV





(TasNetworks)
AC Switching
Station

Gas Insulated Switchgear (GIS)

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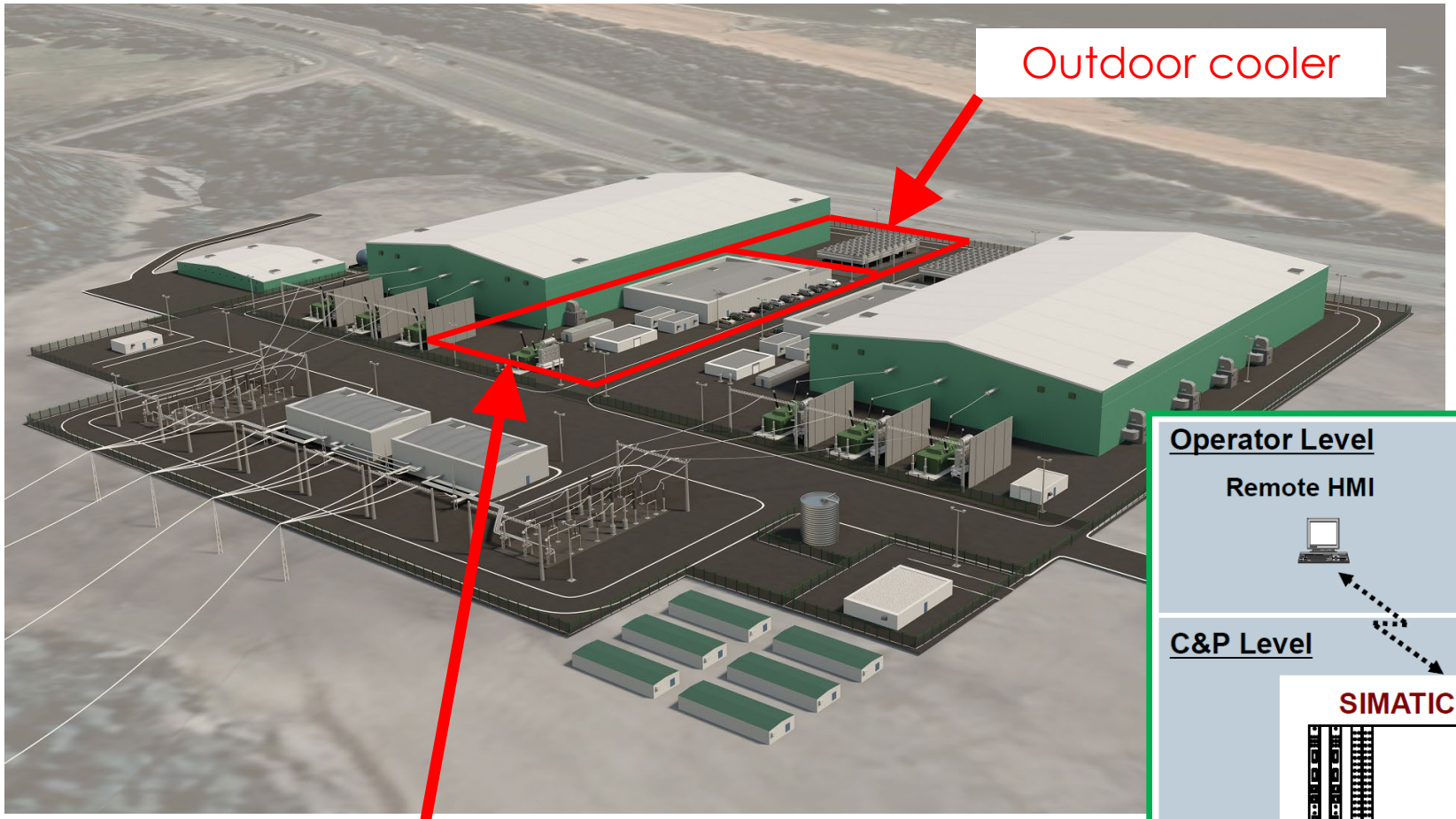
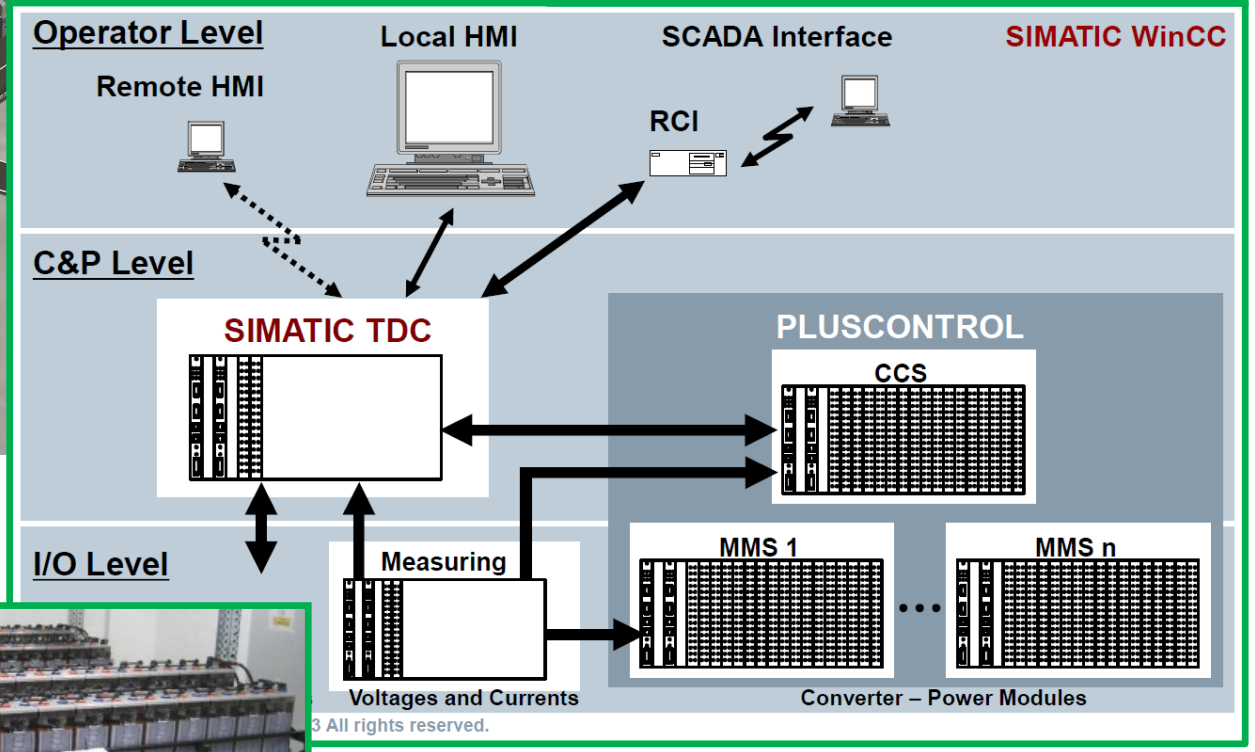
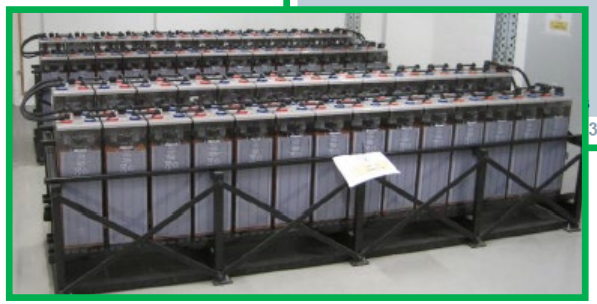
Converter Station – Transformers





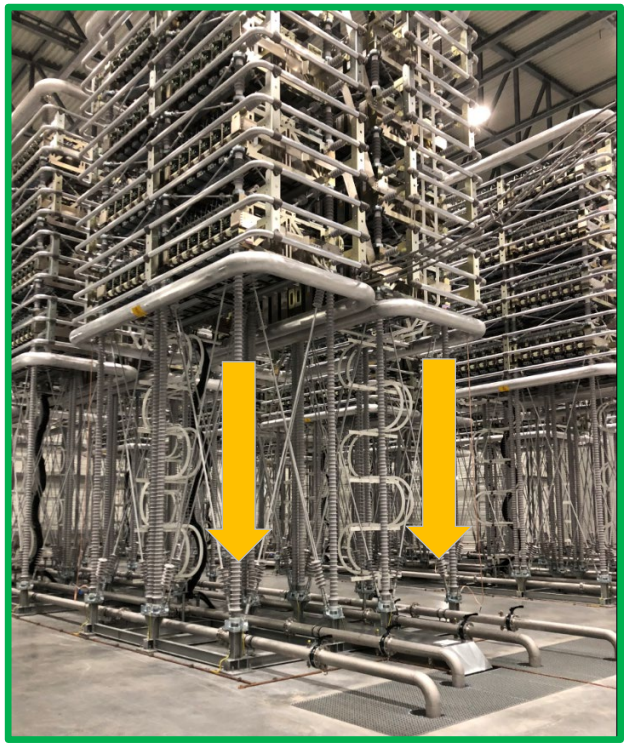
Auxiliaries: control building, valve cooling, Medium voltage switchgear, 220V/110V, batteries, SCADA, HVAC, …



Valve Cooling

Heat evacuation to environment
(outdoor cooler bank)

Heat exchanger



Primary circuit (inside)
Demineralised water

Secondary circuit (outside)
Glycol water

Cables

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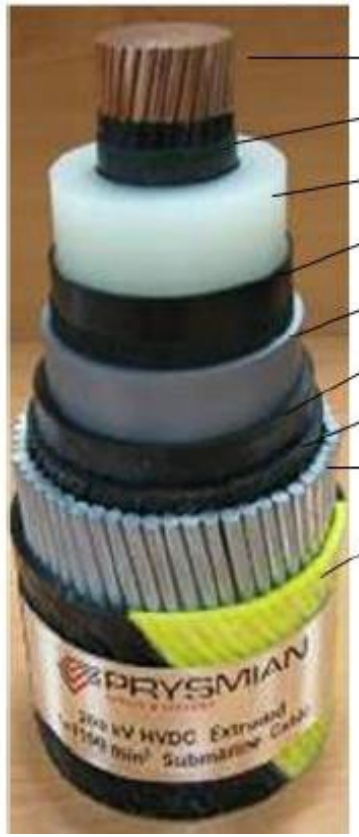
Cable options for HVDC

MIND Cable

XLPE Cable



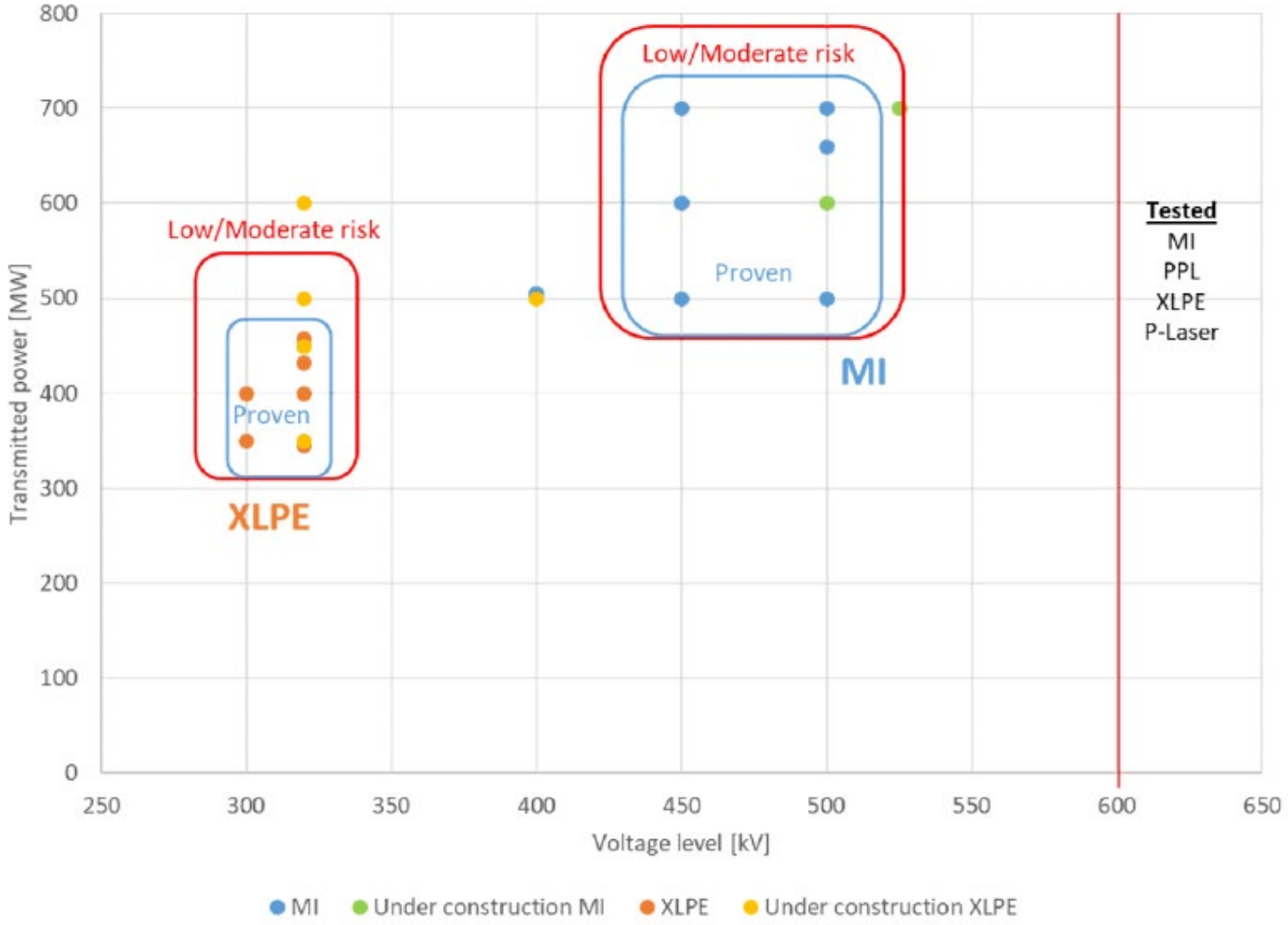
Typ. Weight = 20- 35 kg/m

Typ. Diameter= 90-120 mm

XLPE is preferred due to lower cost and faster installation.

Cable technology risk

Power per cable



Cable manufacturing process

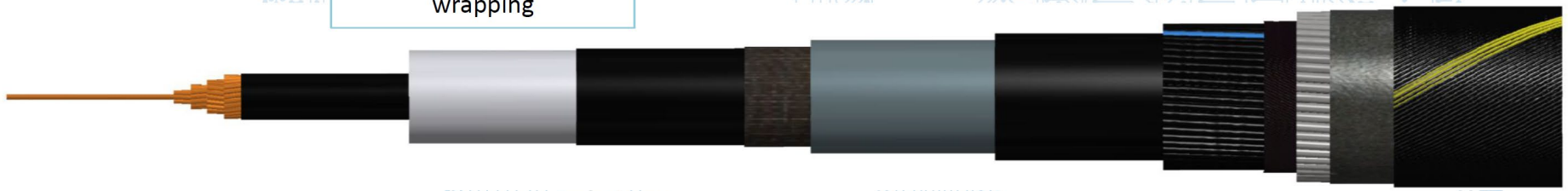
Copper wire drawing

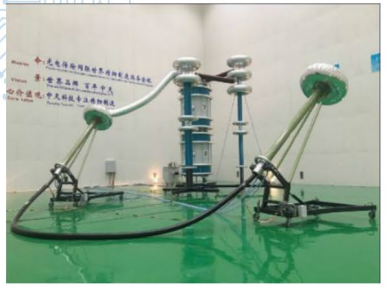
Conductor stranding + semi-conducting tape wrapping

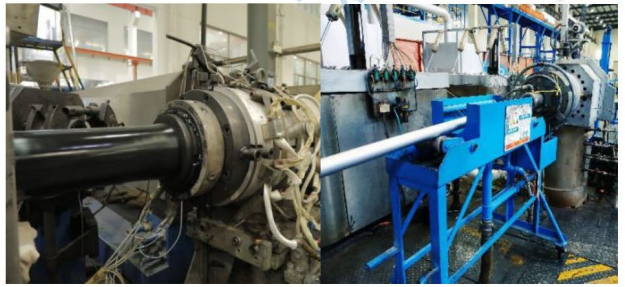
Insulation triple extrusion

Sheath bedding

Degassing







Lead sheath extrusion +PE sheath extrusion

In-process PD, voltage test

Vertical assembly+ wire armor + PP yarn bedding and serving

FAT

On Land Construction

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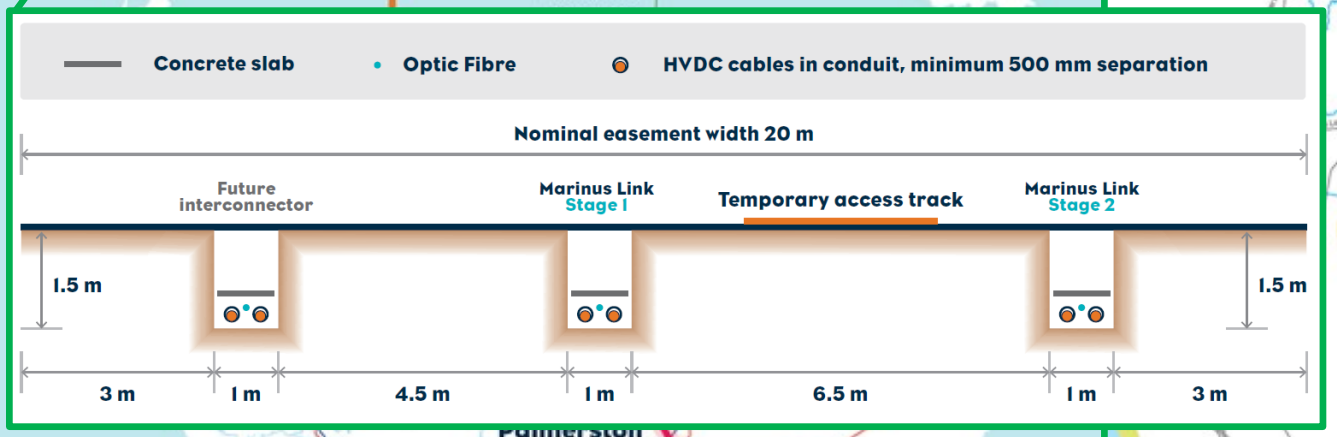
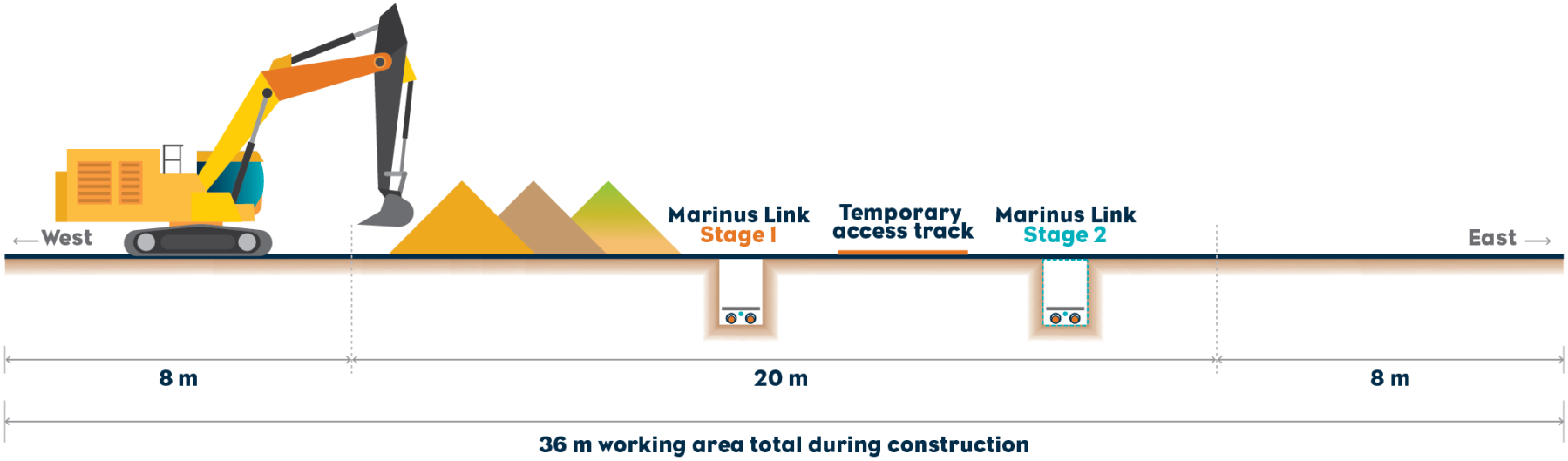
Land Cable (DC)

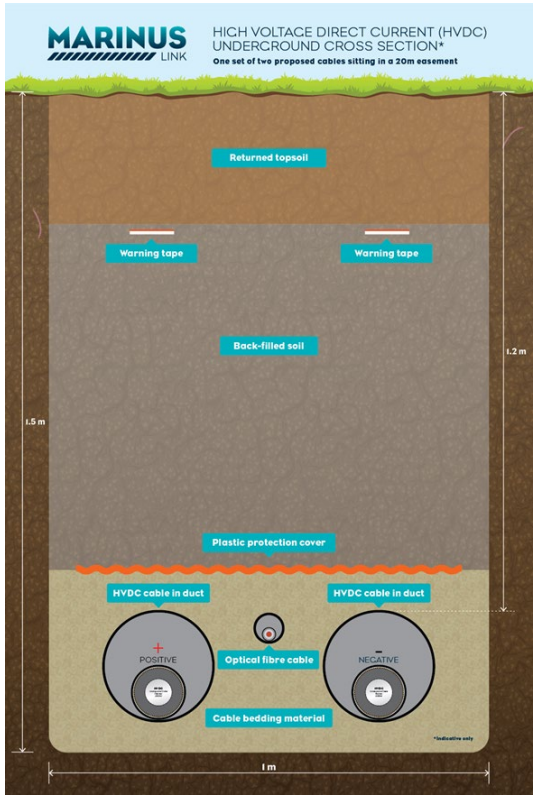


Construction Corridor

INDICATIVE CONSTRUCTION CORRIDOR LAYOUT



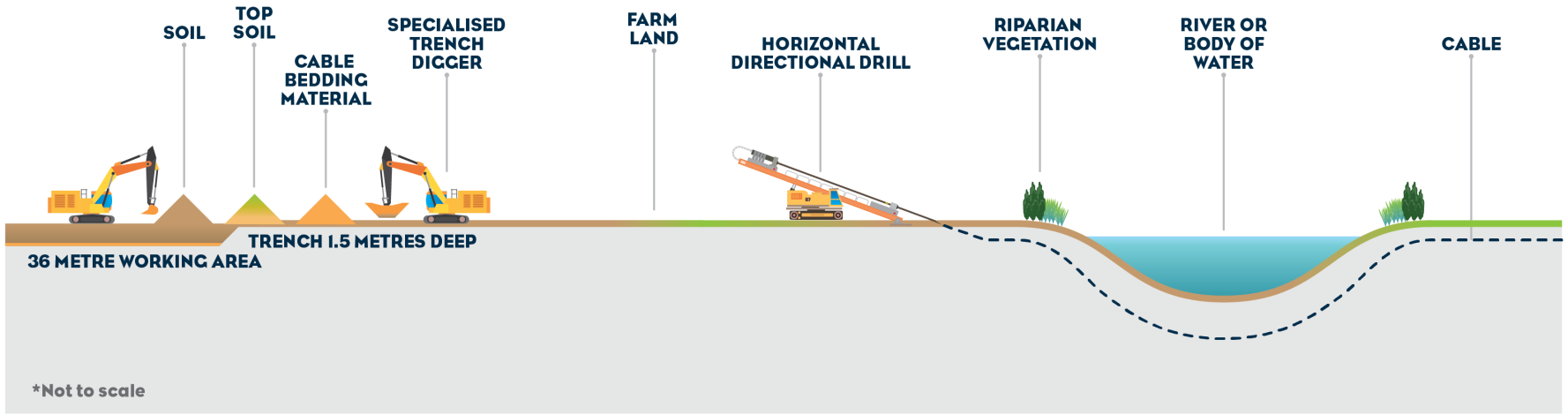
*Not to scale



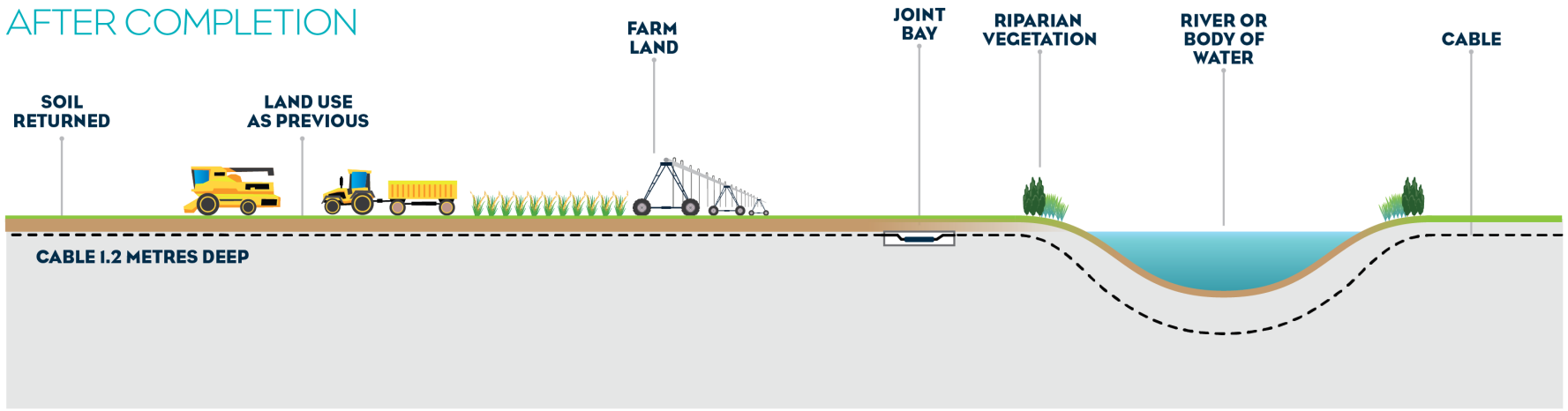
Installed using **open trenching**
The **standard construction corridor will be up to 36 meters wide**

Horizontal Directional Drilling (HDD)

INDICATIVE CONSTRUCTION

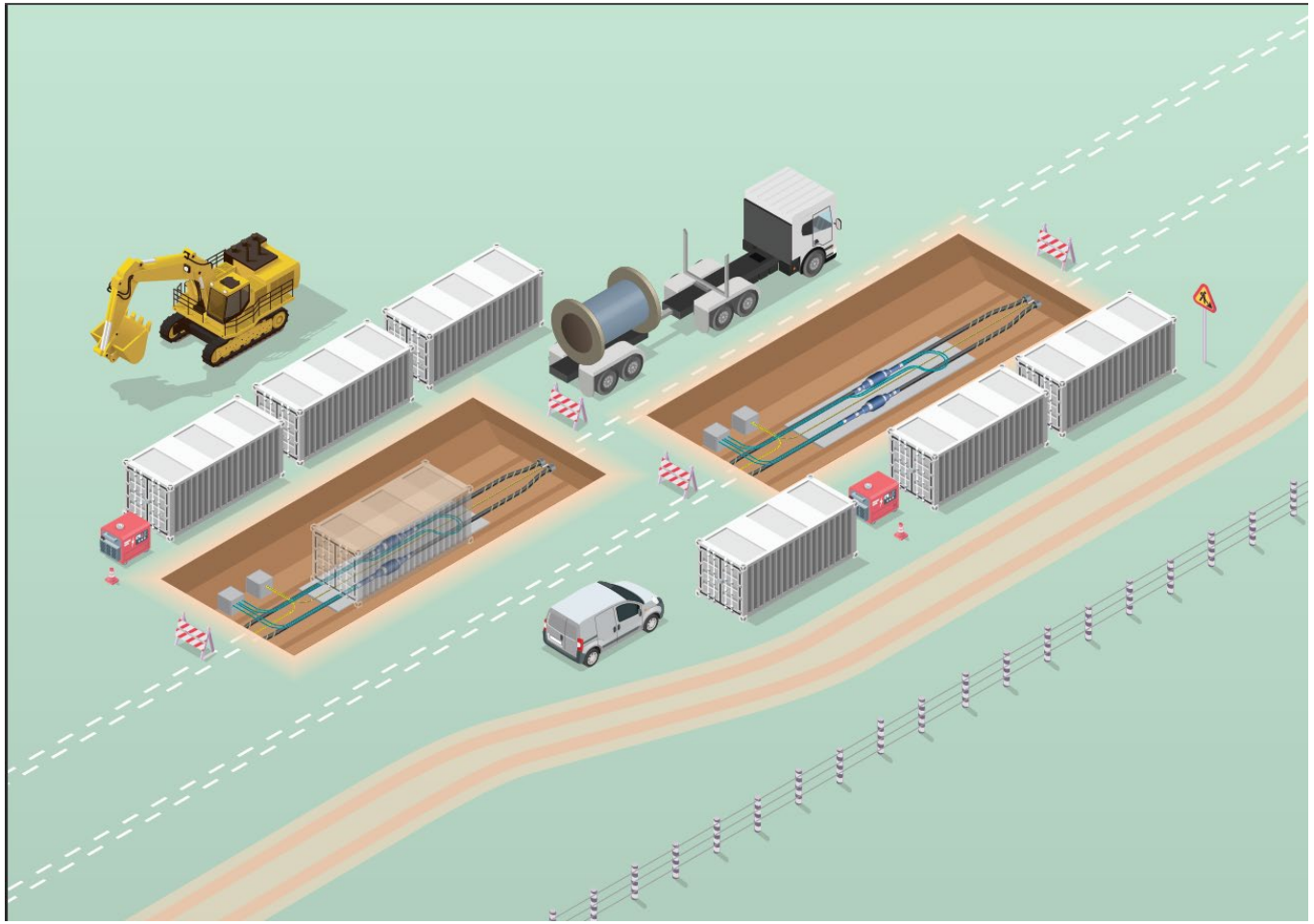


AFTER COMPLETION



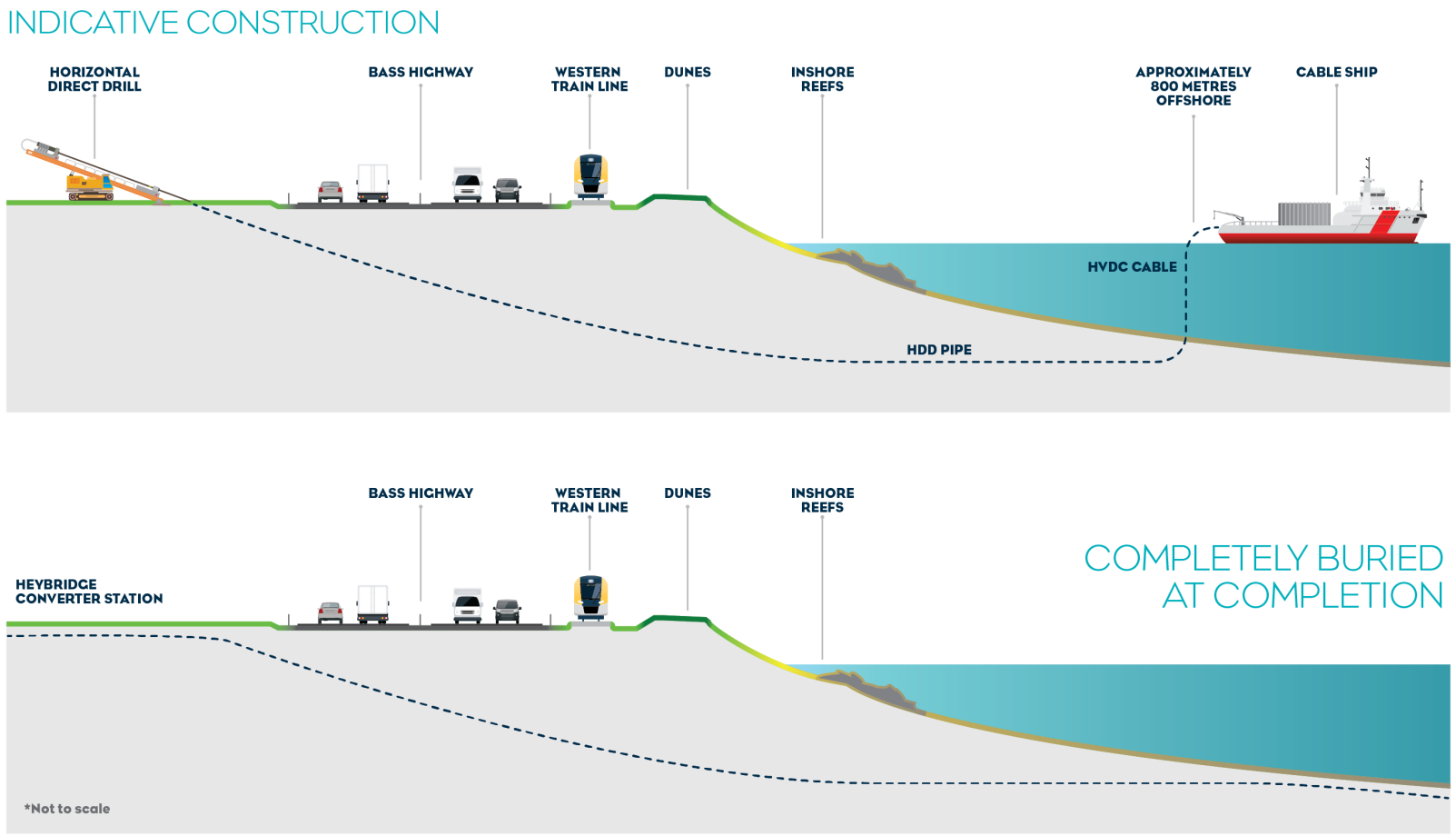
Jointing

Jointing of the Cables



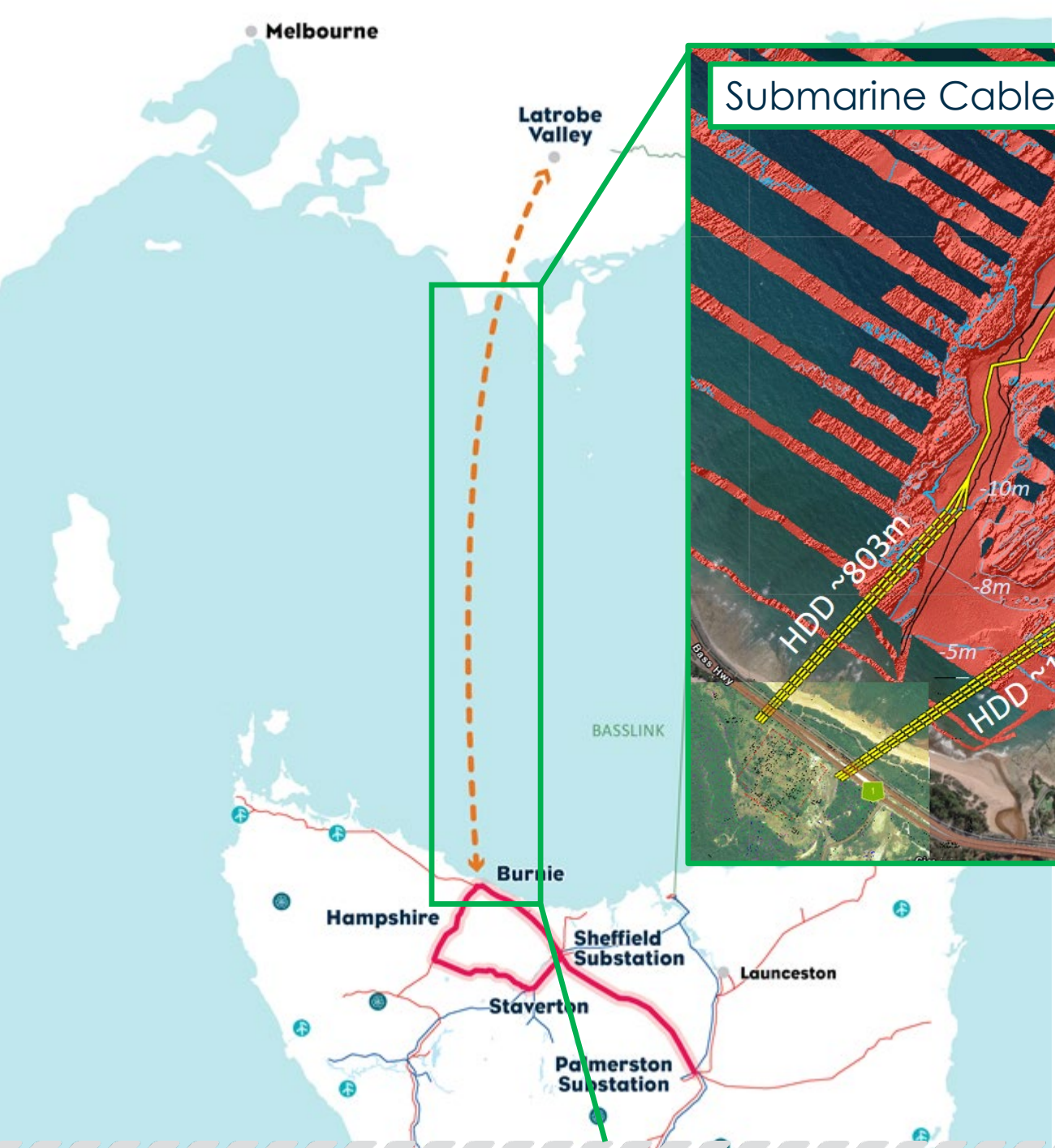
Shore Construction Method

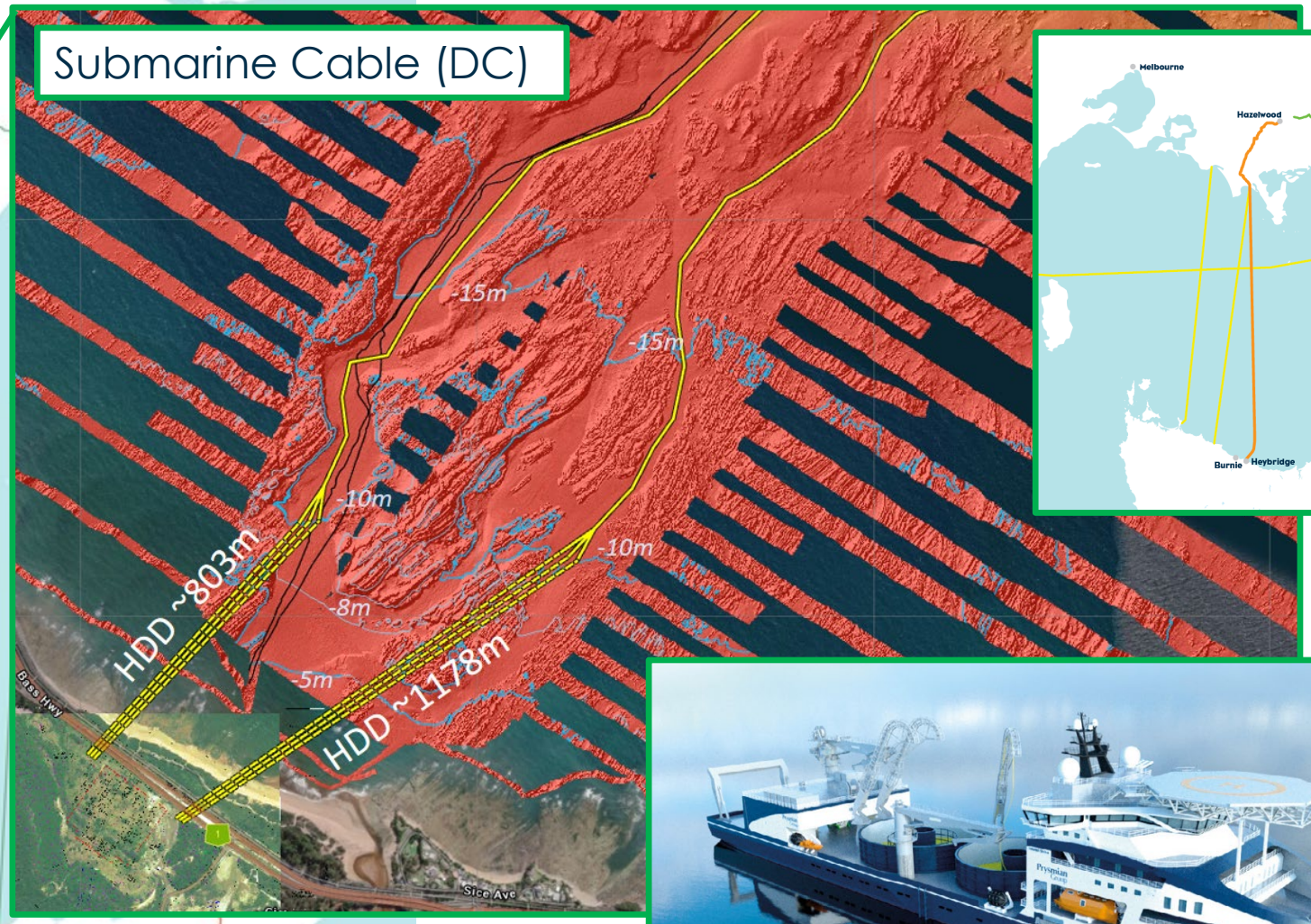
Cross section of landing site



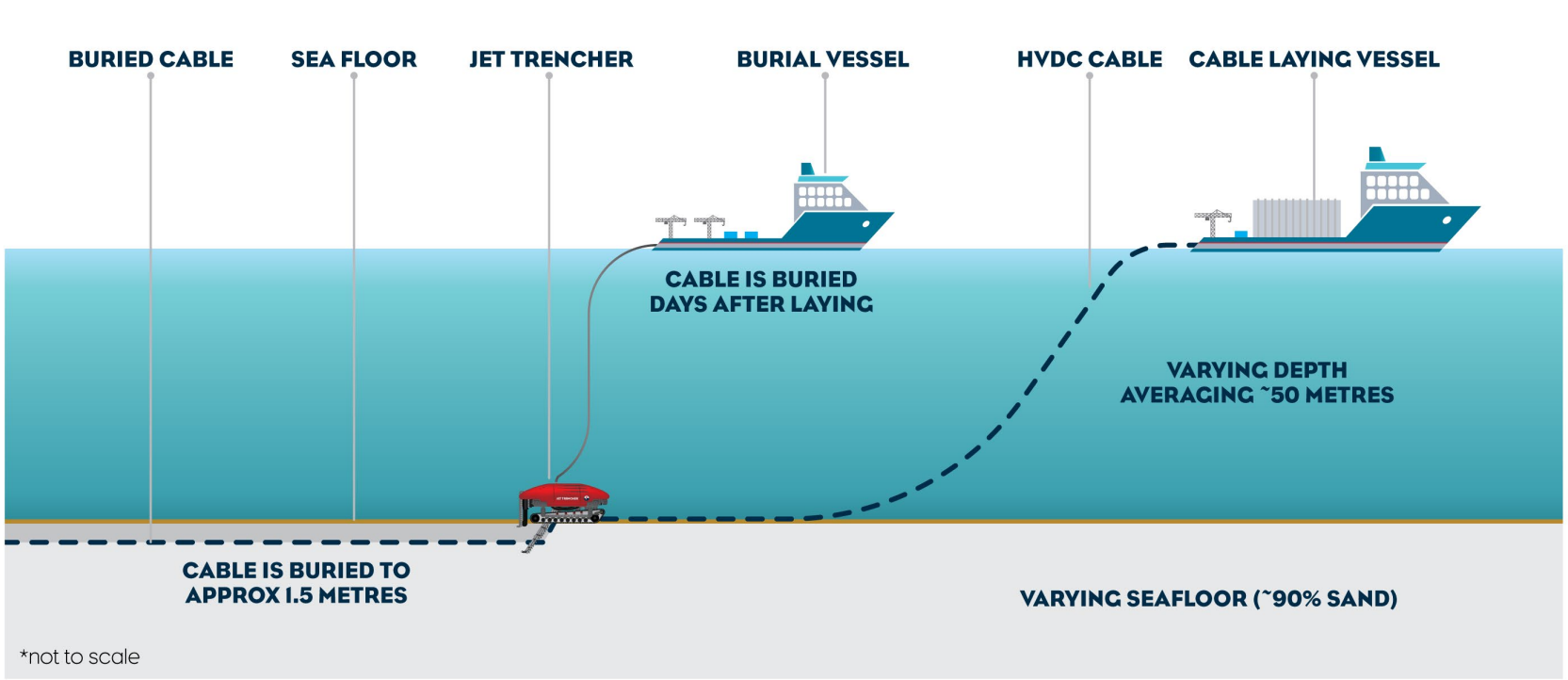
Subsea Construction

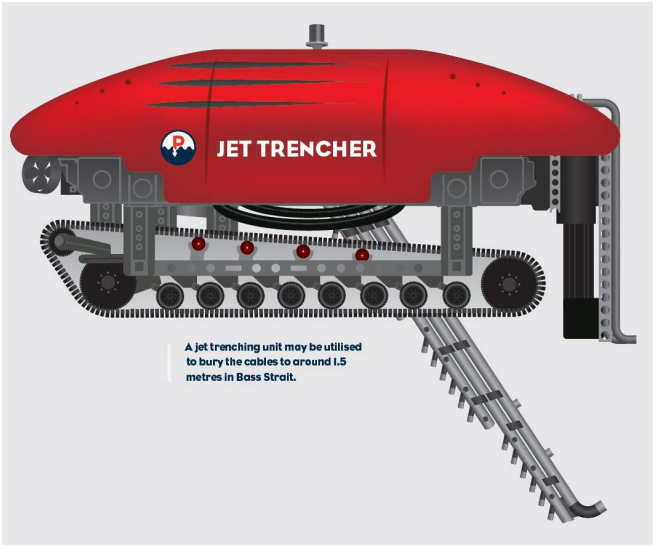
Submarine Cable (DC)





Preparing the Cable Route and Laying and Burying of the Cables

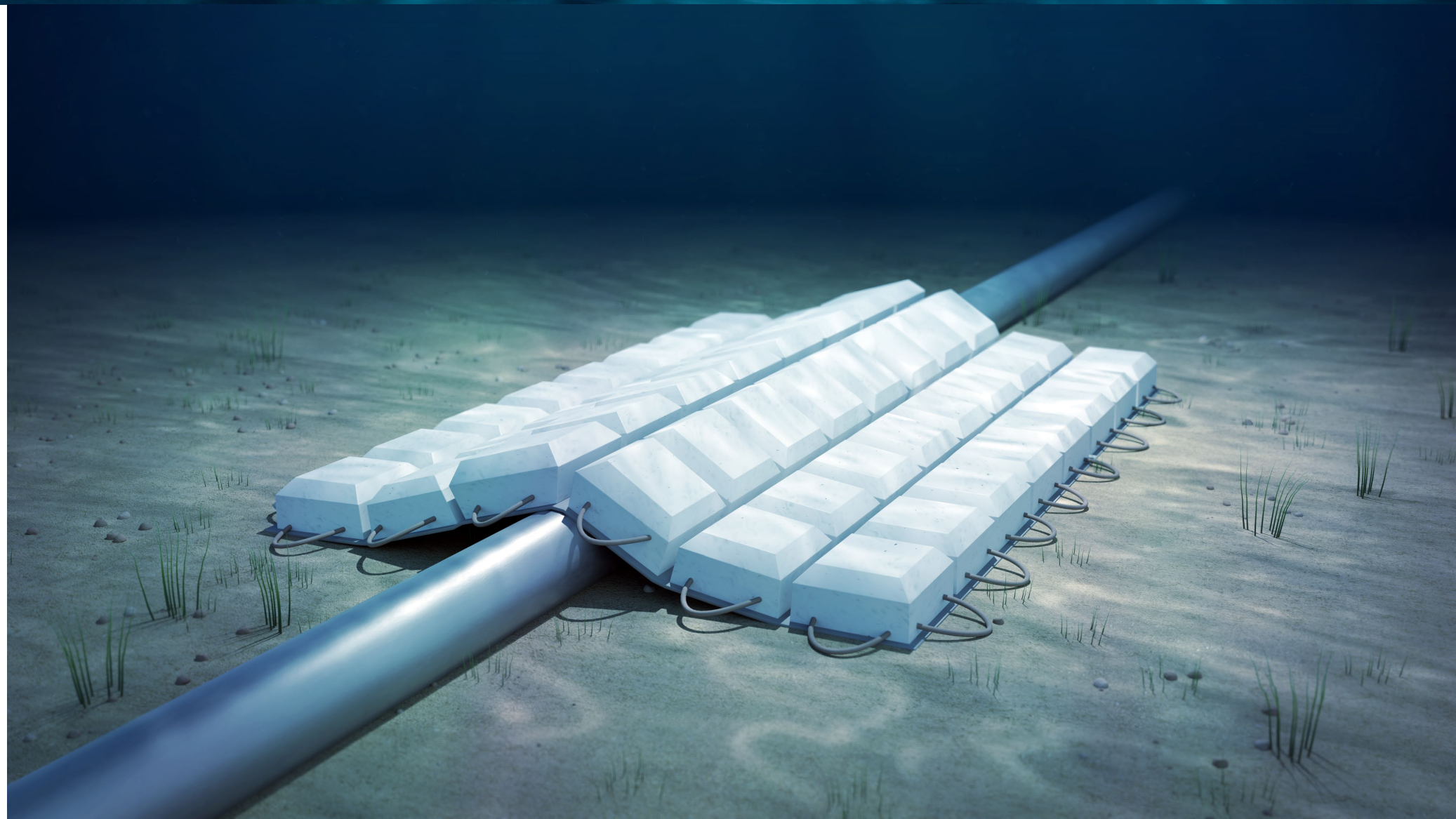




The majority of the subsea cable route has a soft, sandy seafloor, allowing for a water jetting trencher to be used to bury the cables safely and with a low impact to the surrounding environment

Subsea Construction

Where the seabed is hard, the cables will be laid and then protected by using subsea mattresses.



Construction Impacts

ON LAND

Most impacts to native plants, animals and cultural heritage values will be minimised either through minor changes to the route or by using HDD to install the cable in specific locations.

SUBSEA

The proposed route has been chosen to avoid seabed habitats of significance.

The cable installation process causes disturbance of the seabed, which is generally sparsely populated with marine plants and animals along the proposed route.

IMPACT FROM ELECTROMAGNETIC FIELDS (EMF)

EMF occur naturally in the environment because of the earth's magnetic field. EMF are also created by everyday electrical equipment like mobile phones and power lines, as well as the undersea cables of Marinus Link.

Research shows that EMF produced by subsea cables designed like Marinus Link does not create a barrier to sensitive species and they will be able to easily navigate past the cable.

Procurement Strategy

Stephen Clark, Project Director

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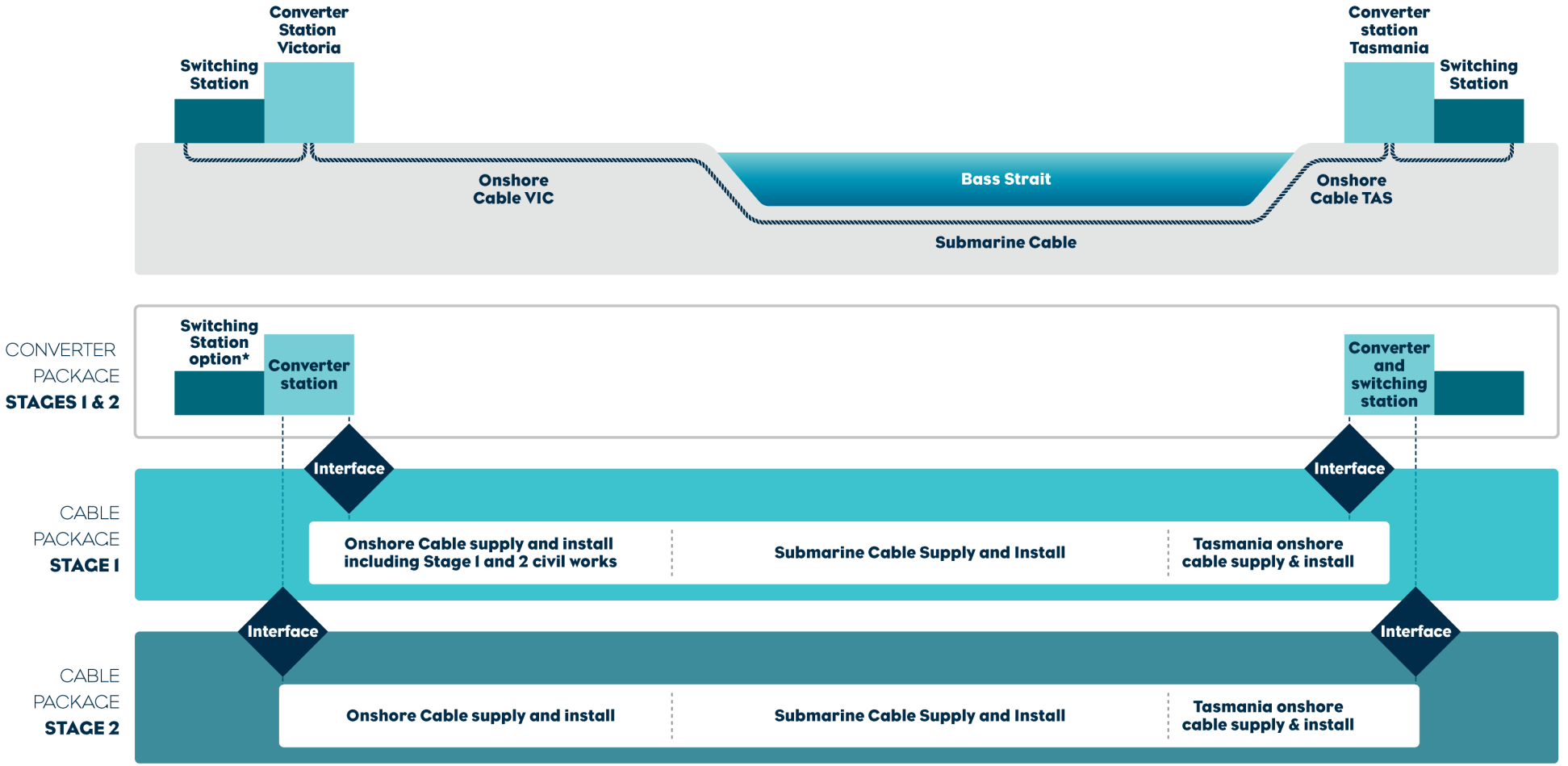
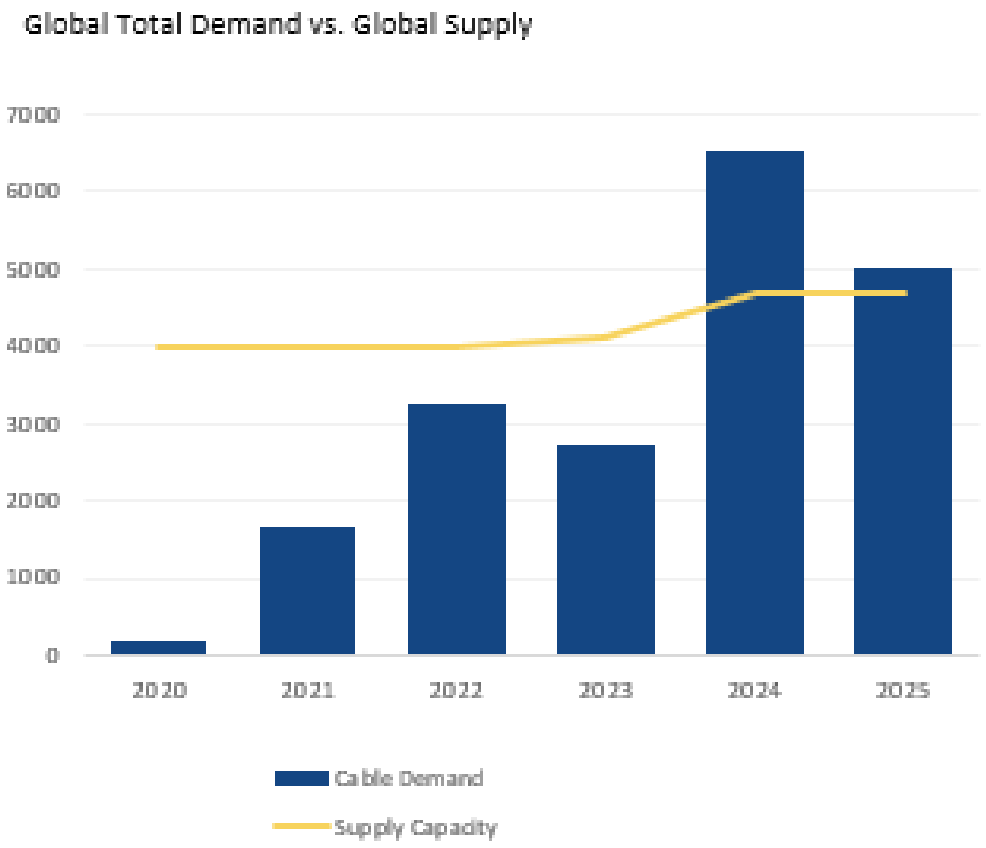
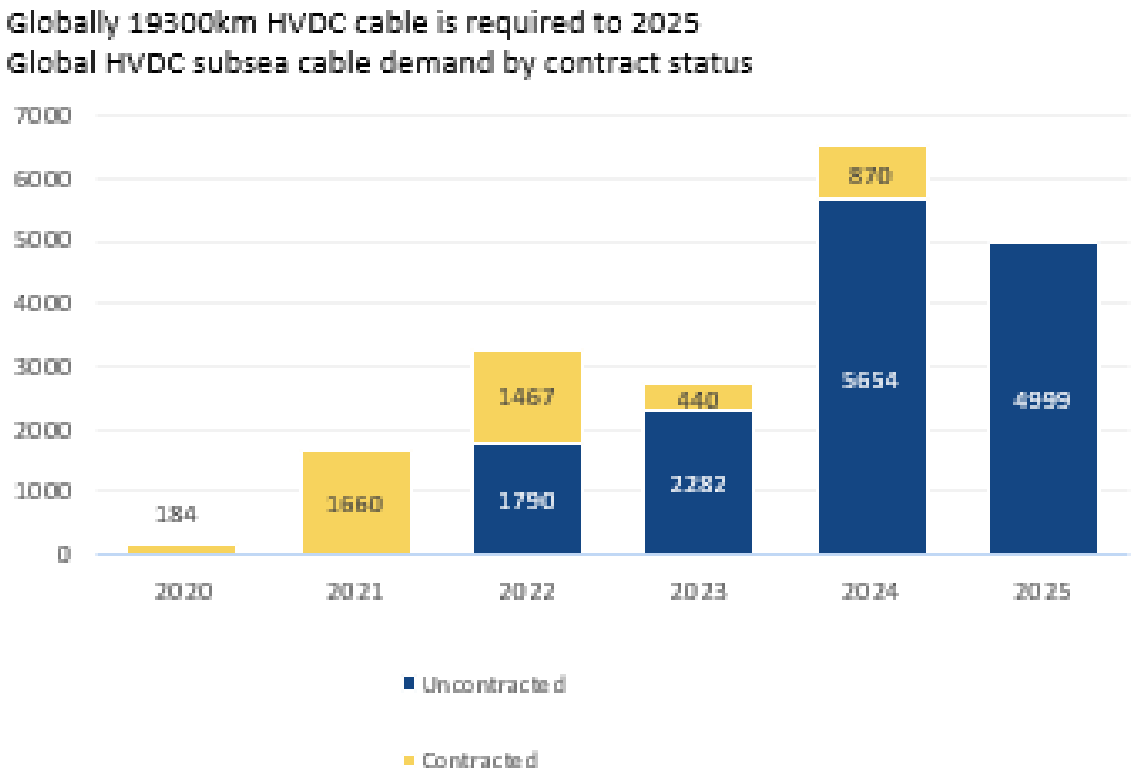
Packaging Strategy



*In Victoria the switching station is an option as it is subject to contestability rules

Cable Demand





Procurement Timetable

Activity	Revised Strategy (Mar 2022) Calendar Year*
Prequalification process commences	Q3 2021 (complete)
Prequalification process concludes	Q4 2021 (complete)
Preparation of Request for Tender (**RFT**) documents	Q4 2021 to Q2 2022 (in progress)
Submarine cable RFT issued	Q3 2022
Converter RFT issued	Q3 2022
Site establishment RFTs (for converter station sites) issued	N/A
Board and any Government approvals of proposed successful cable and converter tenderers	Q2 2024
All cable and converter contracts ready for award	Q3 2024
Final Investment Decision – Stage 1	Q4 2024
Contract award	Q4 2024

* Revised dates are aligned to latest approved project schedule

Next Steps

Local Content

- Established a supply chain portal with the Industry Capability Network (ICN) where suppliers including local businesses can register their interest in the project.
- Engaging with social enterprises to identify socially orientated firms that could supply aspects of the project's requirements.
- Tenders will need to complete an Australian Participation Plan

- More information on the procurement strategy including risk allocation will be discussed at the deliberative workshop session being held on 30 and 31 May 2022 in Melbourne

Q&A

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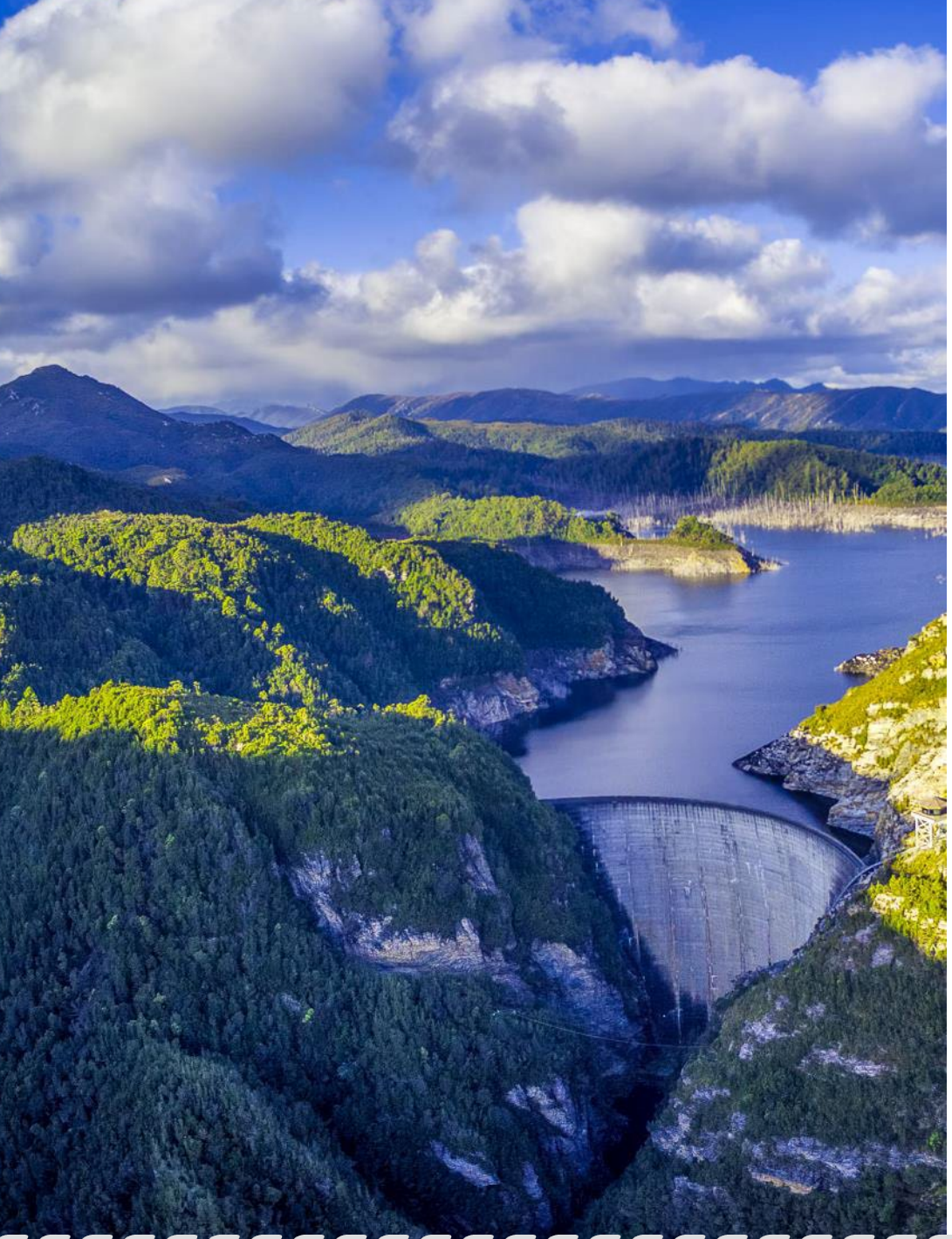

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Find out more:

marinuslink.com.au

Email the team:

team@marinuslink.com.au

Thank you

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