

A photograph of high-voltage power lines and towers stretching across a landscape under a sunset sky. The towers are steel lattice structures, and the lines are multiple parallel cables. The background shows a hazy horizon with more towers in the distance. The foreground is a dirt path with some vegetation. The image is overlaid with a large, semi-transparent teal shape that tapers from the bottom left towards the top right.

PROJECT ENERGYCONNECT




Scope of Works

21 August 2020

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Contents

Glossary of Terms

| | | |
|-----------|--|-----------|
| 1. | OVERVIEW | 5 |
| 2. | ENVIRONMENTAL, PLANNING, CULTURAL HERITAGE, NATIVE VEGETATION, APPROVALS AND STAKEHOLDER AND COMMUNITY ENGAGEMENT | 6 |
| 2.1 | ENVIRONMENTAL AND PLANNING APPROVALS..... | 6 |
| 2.2 | CULTURAL HERITAGE..... | 6 |
| 2.3 | NATIVE VEGETATION CLEARANCE APPLICATION AND APPROVALS..... | 7 |
| 2.4 | STAKEHOLDER ENGAGEMENT AND COMMUNITY CONSULTATION..... | 7 |
| 3. | ROUTE SELECTION, LAND PURCHASE AND EASEMENT ACQUISITION | 8 |
| 3.1 | ROUTE SELECTION..... | 8 |
| 3.2 | LAND PURCHASE AND EASEMENT ACQUISITION..... | 8 |
| 4. | TRANSMISSION LINES | 9 |
| 4.1 | 330KV DOUBLE CIRCUIT TRANSMISSION LINE..... | 10 |
| 4.2 | 275KV DOUBLE CIRCUIT TRANSMISSION LINE..... | 10 |
| 5. | SUBSTATIONS | 11 |
| 5.1 | BUNDEY SUBSTATION..... | 11 |
| 5.2 | ROBERTSTOWN SUBSTATION..... | 16 |
| 5.3 | TUNGKILLO SUBSTATION..... | 19 |
| 6. | TELECOMMUNICATIONS | 21 |
| 6.1 | OPGW..... | 21 |
| 6.2 | MICROWAVE RADIO..... | 21 |
| 7. | POWER SYSTEM PLANNING, INTEGRATION AND TESTING | 23 |
| 8. | SPECIAL PROTECTION SCHEME | 25 |

Glossary of Terms

| Term | Description |
|---------|--|
| ACSR/GZ | Aluminium Conductor Steel Reinforced/Galvanised |
| AEMO | Australian Energy Market Operator |
| ATA | Analogue Telephone Adaptor |
| CB | Circuit Breaker |
| CT | Current Transformer |
| CVT | Capacitive Voltage Transformer |
| DC | Direct Current |
| DNP | Distributed Network Protocol |
| DPTI | Department of Planning, Transport and Infrastructure |
| EFCS | Emergency Frequency Control Scheme |
| EIS | Environmental Impact Statement |
| EPBC | Environmental Protection Biodiversity Conservation |
| EPC | Engineering, Procure and Construct |
| GDL | Generation Dispatch Limiter |
| HMI | Human Machine Interface |
| IP | Internet Protocol |
| LTO | Land Tax Office |
| MCA | Multi Criteria Analysis |
| NEM | National Electricity Market |
| NEMDe | National Electricity Market Dispatch Engine |
| NGM | National Grid Metering |
| NVA | Native Vegetation Act |
| OEM | Original Equipment Manufacturer |
| OPGW | Optical Ground Wire |
| OTR | Office of Technical Regulator |
| PSPM | Power System Performance Monitor |
| PSS | Power System Stabiliser |
| RTU | Remote Terminal Unit |
| SAPN | South Australia Power Networks |
| SPAR | Single Pole Auto Reclose |
| SPS | Special Protection Scheme |
| TNSP | Transmission Network Service Provider |
| TWFL | Travelling Wave Fault Locator |
| VAB's | Vehicle Access Barriers |
| VHA | Vegetation Heritage Agreements |

1. Overview

Project EnergyConnect involves the delivery of a new high voltage interconnector over a route of approximately 900km between the electricity networks of South Australia at Robertstown and New South Wales at Wagga Wagga, together with a spur line linking to Victoria at Red Cliffs. The scope of work for the South Australian component of the project to be delivered by ElectraNet includes:

- Construction of a new 330/275kV substation (provisionally named Bunday);
- Construction of a new 330kV double circuit transmission line from the new Bunday substation to the SA/NSW border;
- Construction of new double circuit 275kV transmission line from the new Bunday Substation to the existing Robertstown Substation;
- Dismantling sections of the existing de-energised 132kV Robertstown to Waterloo line to facilitate the construction of the new 275kV Robertstown to Bunday line;
- The augmentation of Robertstown substation to facilitate the connection of the new 275kV transmission lines from Bunday substation consisting of;
 - Establishment of new line exits in diameters C05 and C07.
 - The augmentation and diversion of the existing 275kV Robertstown to Mokota transmission line from diameter C04 to diameter C05.
 - The augmentation and diversion of the existing 275kV Robertstown to Canowie transmission line from diameter C03 to diameter C07.
 - Upgrading of diameters C03 and C04 to facilitate the connection of the new 275kV transmission lines from Bunday Substation.
- The augmentation of Tungkillo substation to provide the interconnector with additional connections to the transmission network, by:
 - Populating diameter C02.
 - Diverting Robertstown to Para 275kV line into diameter C02.
 - Creation of Robertstown to Para and Tungkillo to Para 275kV lines.
- Extension of Microwave Radio Network to NSW;
- Design and implementation of a Special Protection Scheme;
- Power System Integration;
- Route selection, land purchase and easement acquisition;
- Environmental, cultural heritage and native vegetation planning and approvals; and
- Stakeholder and community engagement.

2. Environmental, Planning, Cultural Heritage, Native Vegetation, Approvals and Stakeholder and Community Engagement

2.1 Environmental and Planning Approvals

- 1) The South Australian portion of Project EnergyConnect requires environmental and planning approval under both South Australian and Commonwealth legislation;
- 2) The Project was declared a Major Development under the *Development Act 1993* (SA) by the South Australian Minister for Planning on 24 June 2019;
- 3) The Project was also determined to be a Controlled Action by the Commonwealth Environment Minister on 19 July 2019, requiring assessment under the *Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999* (Cth). Options to be triggered on or before expiry date (November 2020) to enable land to be formally surveyed and easement forms lodged with the Land Tax Office (LTO) for registration;
- 4) As the Project has been declared a Major Development and is determined to be a Controlled Action, it comes within the ambit of the EPBC Act Bilateral Agreement for Environmental Assessment between the Commonwealth and SA. The effect of this agreement is to allow a single set of impact assessment documents to be prepared, and the South Australian Government Assessment Report will be provided to the Commonwealth Minister for the Environment, who will make a separate decision under Part 9 of the EPBC Act;
- 5) An Environmental Impact Statement (EIS) is required to be prepared in accordance with the guidelines issued by the State Planning Commission (EIS Guidelines) for the consideration of both State and Commonwealth Governments. Environmental authorization from both the State and Commonwealth governments is required before the South Australian portion of Project EnergyConnect may proceed; and
- 6) Assessment of the EIS involves the following steps:
 - a. submission of a draft EIS to the Department of Planning Transport and Infrastructure (DPTI) for review before being released for public consultation;
 - b. a public exhibition / consultation period;
 - c. preparation of a Response Report by ElectraNet responding to submissions made during the public consultation period;
 - d. assessment of the Response Report by DPTI, and preparation of an Assessment Report for the consideration of the SA Planning Minister and the Commonwealth Environment Minister; and
 - e. decision to approve or not approve by the SA Planning Minister and the Commonwealth Environment Minister.

2.2 Cultural Heritage

- 1) Consultation with Traditional Owner Groups (First Peoples of the River Murray and Mallee and Ngadjuri Nation #2);

- 2) Heritage surveys to be undertaken with each Traditional Owner Group to ensure the Project will not impact sites, objects or remains;
- 3) Development of a Cultural Heritage Management Plan for all relevant Traditional Owner groups; and
- 4) Native Title agreements to be negotiated where the Project traverses native title land and to include compensation for potential impacts to native title and employment opportunities for indigenous people.

2.3 Native Vegetation Clearance Application and Approvals

- 1) Native Vegetation surveys across the entire alignment;
- 2) Application to vary registered Native Vegetation Heritage Agreements (VHA) under the *Native Vegetation Act 1991* (NVA) over Calperum and Taylorville stations; and
- 3) Application to clear native vegetation along the alignment prior to construction is required under the NVA, with significant environment benefit measures to offset the clearance.

2.4 Stakeholder Engagement and Community Consultation

- 1) At minimum the Project is required to:
 - a. Undertake suitable and sufficient stakeholder engagement to meet regulatory requirements in a manner consistent with the *Development Act 1993* and the EIS Guidelines; and
 - b. Provide stakeholders with a range of engagement and communication opportunities to enable accessible and genuine participation in the route selection and EIS processes. Stakeholders include Commonwealth and State Government agencies, local councils, traditional owners, specialist interest groups, conservation bodies, regional development agencies etc.

3. Route Selection, Land Purchase and Easement Acquisition

3.1 Route Selection

- 1) Completion of a corridor and route selection process to select an optimal route alignment for the interconnector giving due consideration to technical, land access, environmental, social, economic and stakeholder factors; and
- 2) This process includes stakeholder consultation, specialist study (including but not limited to native fauna, flora, visual, conservation values, cultural heritage, land use, social and engineering) and a Multi- Criteria Analysis (MCA) to identify and evaluate all route alternatives and select and justify a preferred route alignment.

3.2 Land Purchase and Easement Acquisition

- 1) Landholder consultation to inform the route selection process;
- 2) Desktop valuations for an 80m wide easements with compensation packages based on a nominal alignment;
- 3) Option deeds for easement acquisition presented and negotiated with all landholders (34 unique landholders in total); and
- 4) Options to be triggered on or before expiry date (November 2020) to enable land to be formally surveyed and easement forms lodged with LTO for registration.

4. Transmission Lines

The transmission lines work required to complete the SA portion of the project involves the construction of two new double circuit overhead transmission lines between Robertstown substation and the SA/NSW border as well as completing alterations/augmentations to the two existing 275kV transmission lines that enter Robertstown from Mokota and Canowie and the dismantling of sections to the existing de-energised 132kV Robertstown to Waterloo line. All design, procurement, installation and commissioning activities will be completed as part of the scope of works.

The two new double circuit overhead transmission lines will be as follows: -

1. 330kV double circuit transmission line from Bunday Substation to SA/NSW border (ultimately on to Buronga Substation);
2. 275kV double circuit transmission line from Bunday Substation to Robertstown Substation.

The figure below shows the proposed line route for both above mentioned double circuit transmission lines.

A section of the existing de-energised 132kV Robertstown to Waterloo line shall have its conductors removed and strength and stability accessed to allow for the new 275kV double circuit line from Bunday to Robertstown access through the proposed line easement and connection into Robertstown Substation.

The existing 275kV Mokota to Robertstown and Canowie to Robertstown lines at Robertstown Substation will be altered/augmented to allow for connection of the newly established line exits in diameters C05 and C07 respectively, freeing up the existing line exits C03 and C04 for the new Bunday to Robertstown 275kV lines.

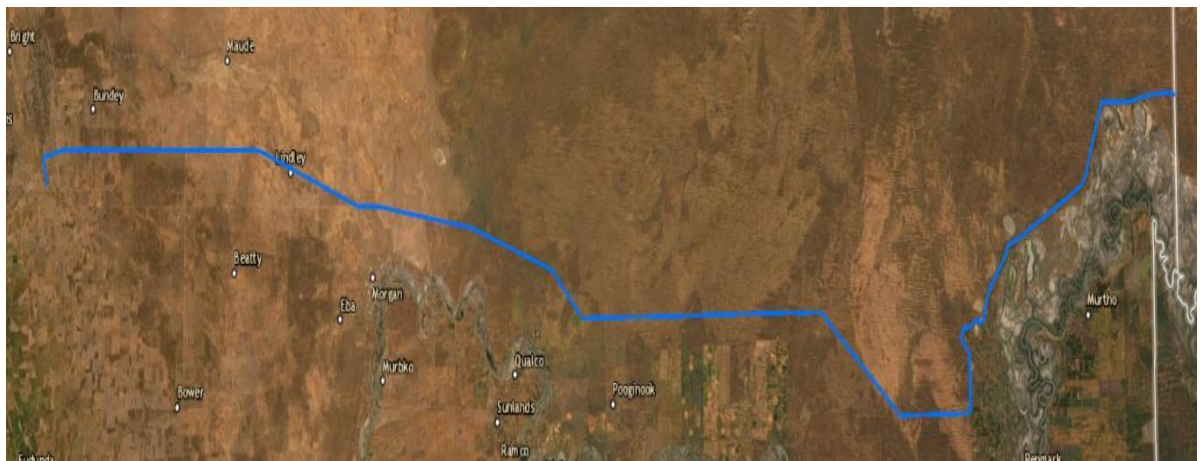


Figure 1: Proposed Line Route for Project Energy Connect

4.1 330kV Double Circuit Transmission Line

- 1) Structures: A new suite of 330kV double circuit lattice structures;
- 2) Structure Foundations: Standard bored pile foundations;
- 3) Insulators: Toughened Glass discs;
- 4) Overhead Conductors, Earth Wire & OPGW:
 - a. Twin Mango ACSR/GZ Conductor per phase;
 - b. Single Grape ACSR/GZ Earth wire; and
 - c. Single 14.3mm OPGW.

4.2 275kV Double Circuit Transmission Line

- 1) Structures: Existing suite of 275kV double circuit lattice structures;
- 2) Structure Foundations: Standard bored pile foundations;
- 3) Insulators: Toughened Glass discs;
- 4) Overhead Conductors, Earth Wire & OPGW:
 - a. Twin Olive ACSR/GZ Conductor per phase;
 - b. Single Grape ACSR/GZ Earth wire; and
 - c. Single 14.3mm OPGW.

5. Substations

The sections below describe the various scope of works at Bunday Substation, Robertstown Substation and Tungkillo Substation which are required to be completed to facilitate the interconnection forming part of Project Energy Connect.

5.1 Bunday Substation

Bunday substation will comprise of a 330kV and a 275kV switchyards with 330/275kV Auto Transformers stepping the voltage down to allow for connection into the 275kV network. The switchyard layouts will comprise of a CB and a half format for each line exit as shown in section 5.1.4.

5.1.1 Civil Works

The civil works will include the design, verification, certification and construction of the following:

5.1.1.1 General Civil Works

- 1) Removal of vegetation in the proposed area of work;
- 2) Bulk earthworks for the entire substation;
- 3) Internal and external substation access roads;
- 4) Substation platform stormwater drainage and appropriate discharge point(s) including flood control measures; and
- 5) Substation site security fencing and gates (including temporary fencing and stock fencing as required).

5.1.1.2 Substation Yard Foundations

- 1) Foundations for all plant and structures including lighting and lightning masts, gantries and transformer bunds;
- 2) Foundations for buildings;
- 3) Foundations for a diesel generator;
- 4) Cable ducts, cable pits, trenches and conduits (including suitably load-rated trench covers when crossing roadways);
- 5) Telecommunication pits and conduits required for the cabling, both multicore and fibre optic cables; and
- 6) Substation earthing including main earth grid, risers, trench covers, and Vehicle Access Barriers (VABs).

5.1.2 Primary Infrastructure

The following primary plant is required to be installed and commissioned.

5.1.2.1 Substation Connection Works

Install all required droppers from the newly formed 330kV double circuit transmission lines from NSW's Buronga Substation, 275kV double circuit transmission lines to Robertstown substation, including from the landing span line onto the disconnectors / surge arrestors.

5.1.2.2 330kV Switchyard

- 1) 330 kV single pole (SPAR) circuit breakers;
- 2) 330 kV post current transformers (CTs);
- 3) 330 kV capacitive voltage transformers (CVTs);
- 4) 330 kV motorised disconnectors (with manual operated integrated earth switch/s);
- 5) 330 kV surge arrestors;
- 6) 330 kV post insulators;
- 7) 330/275 kV auto transformers 400MVA;
- 8) 330 kV shunt reactors 60MVAR;
- 9) 330 kV bus bars;
- 10) 330 kV Gantry Lattice Structures;
- 11) Overhead strung bus including associated insulators and hardware; and
- 12) Miscellaneous bus, Interplant conductors, connectors including terminal Palms and other fittings to complete installation.

5.1.2.3 275kV Switchyard

- 1) 275 kV single pole (SPAR) circuit breakers;
- 2) 275 kV post current transformers (CTs);
- 3) 275 kV capacitive voltage transformers (CVTs);
- 4) 275 kV motorised disconnectors (with manual operated integrated earth switch/s);
- 5) 275 kV surge arrestors;
- 6) 275 kV post insulators;
- 7) 275 kV Shunt Capacitor Bank 100MVAR;
- 8) 275 kV bus bars;
- 9) 275 kV Gantry Lattice Structures;
- 10) Overhead strung bus including associated insulators and hardware; and
- 11) Miscellaneous bus, Interplant conductors, connectors including terminal Palms and other fittings to complete installation.

5.1.2.4 Auxiliary Power Supplies

- 1) 300kVA Station transformers (main supplies); and
- 2) 150kVA Diesel generators (backup supply).

5.1.3 Secondary System Infrastructure

The following secondary systems equipment is required to be installed and commissioned.

5.1.3.1 330kV Switchyard

- 1) Two Buronga 330 kV Feeder protection cubicles;
- 2) Ten CB Management 330 kV cubicles;
- 3) Three transformer 330/275 kV protection cubicles;
- 4) Two Line Reactor 330 kV protection cubicles;
- 5) Two Bus Zone 330 kV protection cubicles; and
- 6) One Station Control cubicle.

5.1.3.2 275kV Switchyard

- 1) Two Robertstown 275 kV Feeder protection cubicles;
- 2) Nine CB Management 275 kV cubicles;
- 3) Three transformer 330/275 kV LV protection cubicles
- 4) One Shunt Capacitor 275 kV protection cubicles;
- 5) Two Bus Zone 275 kV protection cubicles; and
- 6) One Station Control cubicle.

5.1.3.3 Automation & SCADA

- 1) Connect all new relays in the associated Control Buildings to OpsNet switches for DNP over IP interface to RTUs;
- 2) HMI workstations; and
- 3) Tekron clocks.

5.1.3.4 DC Systems and Distribution

Fully duplicated 110 V_{DC} supply system comprised of a duplicated set of battery banks (Set 1 and Set 2), battery chargers and DC distribution boards per control building.

5.1.3.5 National Grid Metering;

- 1) One NGM metering Cubicle comprising four EDM1 MK6e Type 2 meters;
 - a) Main and check meters for Bunday – Buronga 1;
 - b) Main and check meters for Bunday – Buronga 2; and
 - c) Main and check modems for communication to data agent.

5.1.3.6 Telecommunications

The following telecommunication works will be installed and commissioned:

- 1) Miscellaneous fibre and connections from OPGW on the gantries to the control building;
- 2) 50m Roam Tower inside the substation boundary fence;
- 3) Telecommunication cubicle per switchyard;
- 4) Two duplicated analogue telephone adapters (ATA), per building;
- 5) One Wireless Access Point for internet access per building; and
- 6) One Wireless Access Point for internet access per building.

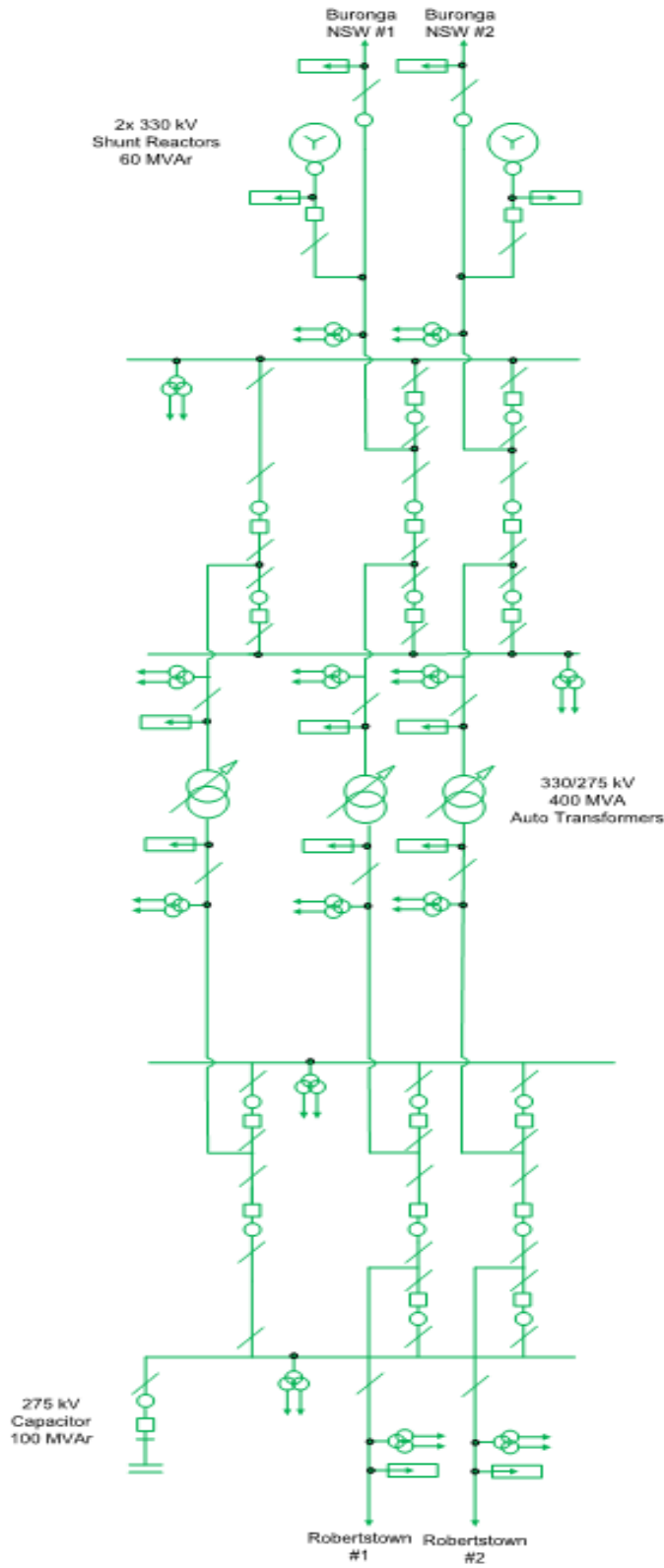
5.1.3.7 Asset Performance

- 1) 330kV Power system monitoring and Fault Locator cubicle (PSPM/TWFL cubicle);
- 2) 275kV Power system monitoring and Fault Locator cubicle (PSPM/TWFL cubicle); and
- 3) PMUs on all line exits.

5.1.3.8 Fire & Security

- 1) Install and commission the Fire and Security panel in all require substation buildings;

5.1.4 Bunday Simplified Single Line Diagram



5.2 Robertstown Substation

The following engineering discipline specific scope of works is required to complete the project.

- 1) Establishment of new line exits in diameters C05 and C07;
- 2) The augmentation and diversion of the existing 275kV Robertstown to Mokota transmission line from diameter C04 to diameter C05;
- 3) The augmentation and diversion of the existing 275kV Robertstown to Canowie transmission line from diameter C03 to diameter C07; and
- 4) Uprating of diameters C03 and C04 to facilitate the connection of the new 275kV transmission lines from Bunday Substation.

5.2.1 Civil Works

5.2.1.1 Substation Yard Foundations

- 1) Foundations for all plant and structures in line exits bays on diameter C05 & C07.

5.2.2 Primary Infrastructure

The following primary plant is required to be installed and commissioned to allow for the connection to Bunday Substation.

5.2.2.1 Substation Connection Works

- 1) Install all required droppers from the newly formed 275kV double circuit transmission lines from Bunday into existing C03 & C04 populated diameters; and
- 2) Install all required droppers from the augmentation of the Mokota to Robertstown and Canowie to Robertstown lines into newly formed C05 and C07 lines exits.

5.2.2.2 Existing Substation Primary Plant (C03 and C04)

- 1) Replacement of two 275 kV single pole (SPAR) circuit breakers in diameter C04;
- 2) Replacement of one set of 275 kV post current transformers (CTs) in diameter C03;
- 3) Replacement of two sets of 275 kV post current transformers (CTs) in diameter C04;
- 4) Replacement of two motorised disconnectors (with manual operated integrated earth switch/s) in diameter C03; and
- 5) Replacement of two motorised disconnectors (with manual operated integrated earth switch/s) in diameter C04.

5.2.2.3 New Substation Primary Plant (C05 and C07)

- 1) One 275 kV single pole (SPAR) circuit breaker in diameter C05;
- 2) One 275 kV single pole (SPAR) circuit breaker in diameter C07;

- 3) One set of 275 kV post current transformers (CTs) in diameter C05;
- 4) One set of 275 kV post current transformers (CTs) in diameter C07;
- 5) One set of 275 kV capacitive voltage transformers (CVTs) in diameter C05;
- 6) One set of 275 kV capacitive voltage transformers (CVTs) in diameter C07; and
- 7) Two 275 kV motorised disconnectors (with manual operated integrated earth switch/s) in diameter C05;
- 8) Two 275 kV motorised disconnectors (with manual operated integrated earth switch/s) in diameter C07;
- 9) One set of 275 kV surge arrestors in diameter C05;
- 10) One set of 275 kV surge arrestors in diameter C07; and
- 11) 275 kV post insulators in diameter C05 and C07.

5.2.3 Secondary Infrastructure

The following secondary system equipment and modifications are required to be installed and commissioned to allow the connection to allow for the connection to Bunday Substation.

5.2.3.1 Substation Protection Works

- 1) Bunday 1 Line (C03) – install and commission new Set X and Set Y protection relays to match remote end;
- 2) Bunday 2 Line (C04) – install and commission new Set X and Set Y protection relays to match remote end;
- 3) Tungkillo 2 Line (C03) – install and commission new Set X and Set Y protection relays to match remote end;
- 4) Mokota Line Protection Cubicle (C05); and
- 5) Canowie Line Protection Cubicle (C07).

5.2.3.2 Automation and SCADA

- 1) Connect all new relays to existing D20 RTU for DNP over IP interface to RTU; and
- 2) HMI updates to reflect new line exit names.

5.2.3.3 Telecommunications

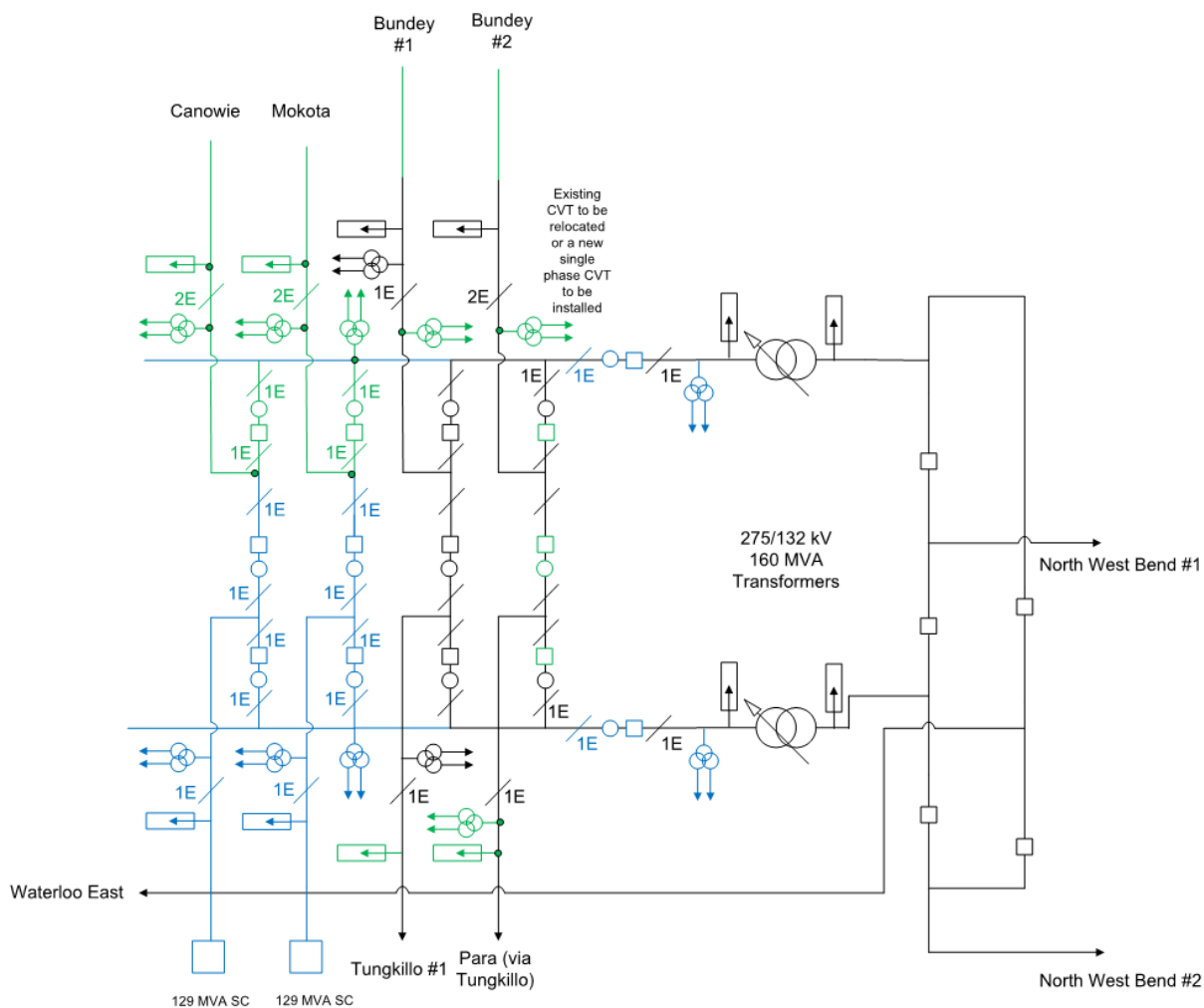
- 1) Establish new communication path for the new 275kV transmission lines to Bunday Substation;
- 2) Re-route current comms path to Para Substation and to Tungkillo Substation; and
- 3) Establish new radio link to Monash Substation.

5.2.3.4 Asset Performance

- 1) PSPM updates to reflect line exit name changes.

5.2.4 Robertstown Simplified Single Line Diagram

Project EnergyConnect scope of works is shown in green and Main Grid System Strength scope of works shown in blue. All existing Robertstown assets are shown in black.



5.3 Tungkillo Substation

A newly formed diameter is required within the existing Tungkillo Substation to allow for a more integrated 275kV network for the interconnection between NSW and SA.

5.3.1 Civil Works

5.3.1.1 Substation Yard Foundations

- 1) Foundations for all plant and structures in diameter C02.

5.3.2 Primary Infrastructure

The following primary plant is required to be installed and commissioned to allow for the new diameter.

5.3.2.1 Substation Connection Works

- 1) Install all required droppers from the existing 275kV transmission lines from Robertstown and Para Substations into newly populated diameter C02 to create Robertstown to Tungkillo 2 and Tungkillo to Para 2 lines.

5.3.2.2 Substation Primary Plant

- 1) 275 kV single pole (SPAR) circuit breakers;
- 2) 275 kV post current transformers (CTs);
- 3) 275 kV capacitive voltage transformers (CVTs);
- 4) 275 kV motorised disconnectors (with manual operated integrated earth switch/s);
- 5) 275 kV surge arrestors; and
- 6) 275 kV post insulators.

5.3.3 Secondary Infrastructure

The following secondary system equipment and modifications are required to be installed and commissioned to allow for the new diameter.

5.3.3.1 Substation Protection Works

- 1) Robertstown 275 kV Feeder protection cubicle;
- 2) Para 275 kV Feeder protection cubicle; and
- 3) Three CB Management 275 kV cubicles.

5.3.3.2 Automation and SCADA

- 1) Connect all new relays to existing C50 RTU for DNP over IP interface to RTU;
- 2) HMI updates to reflect new diameter; and
- 3) Station cubicle modifications for all new plant.

5.3.3.3 Telecommunications

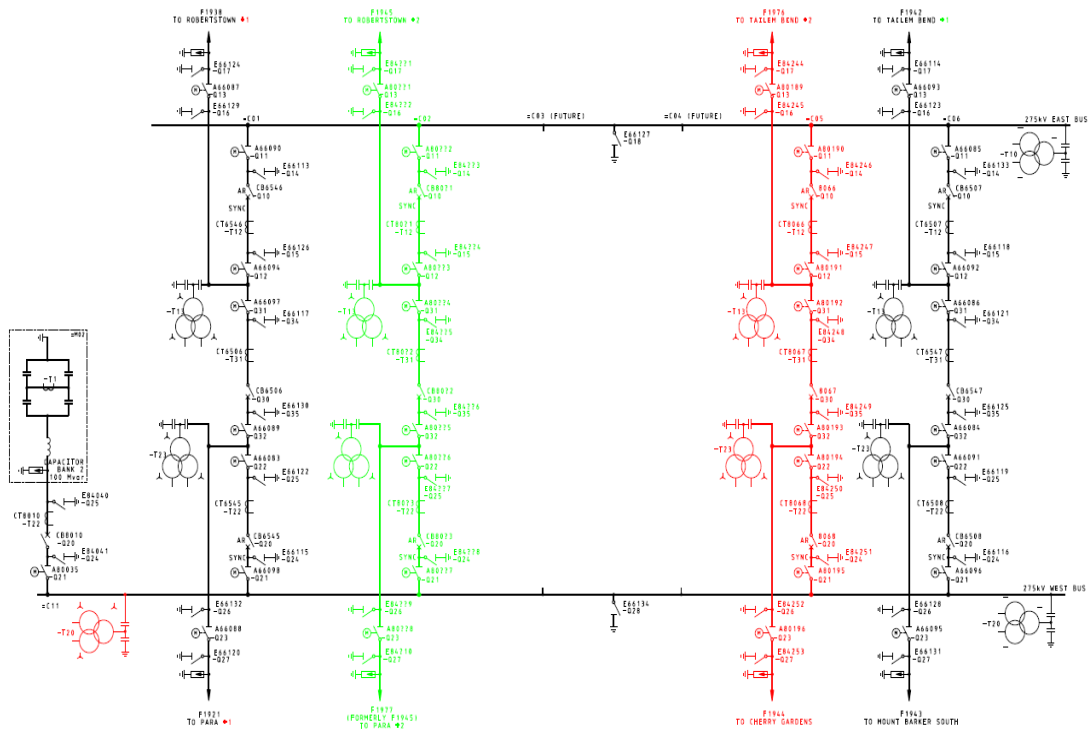
- 1) Establish new communication path to Robertstown Substation; and
- 2) Establish new communication path to Para Substation.

5.3.3.4 Asset Performance

- 1) Modifications to existing PSPM cubicle to include newly formed Robertstown to Tungkillo 2 line and Tungkillo to Para 2 Line.

5.3.4 Tungkillo Simplified Single Line Diagram

Project EnergyConnect scope of works is shown in green and a future regulated project scope of works shown in red. All existing Tungkillo assets are shown in black.



6. Telecommunications

Listed below is the additional scope of telecommunication works required (over and above the works included within the substations) to facilitate the interconnection between SA and NSW.

Telecommunications between Robertstown substation, Bundy substation and TransGrid's Buronga Substation will consist of one (OPGW) fibre path and one microwave radio path. Bunday Substation will carry protection and SCADA on two diverse paths. The microwave radio path will link Bunday Substation to Monash Substation and three new radio sites to ultimately link up to Buronga Substation.

6.1 OPGW

One addition OPGW repeater site will be required between Bunday substation and Buronga substation with the preliminary location identified at Cooltong.

6.1.1 Cooltong Fibre Repeater

- 1) Complete new Fibre Repeater site;
- 2) Complete Container Building;
- 3) Two fibre Synchronous Transport Module 1 links via OPGW;
- 4) 48V Solar Photovoltaic Power Supply; and
- 5) Site Fencing.

6.2 Microwave Radio

Three additional Microwave Radio sites will be required between Bunday substation and Buronga substation with the preliminary locations identified at Morkalla, Bambill and Pirlta.

6.2.1 Morkalla Microwave Radio Site

- 1) Complete new Radio Repeater site with 50m Roam Tower;
- 2) Complete Container Building;
- 3) Two Radio Links;
- 4) Mains Power Supply and 48V Battery Back-up Supply; and
- 5) Site Fencing.

6.2.2 Bambill Microwave Radio Site

- 1) Complete new Radio Repeater site with 50m Roam Tower;
- 2) Complete Container Building;
- 3) Two Radio Links;

- 4) Mains Power Supply and 48V Battery Back-up Supply; and
- 5) Site Fencing.

6.2.3 Pirlta Microwave Radio Site

- 1) Complete new Radio Repeater site with 50m Roam Tower;
- 2) Complete Container Building;
- 3) Two Radio Links;
- 4) Mains Power Supply and 48V Battery Back-up Supply; and
- 5) Site Fencing.

7. Power System Planning, Integration and Testing

The following planning, system integration and testing requirement are applicable for the project

- 1) Detailed design studies for scoping and specification of the project;
- 2) AEMO and inter-regional coordination including inter-interconnector network testing and Interconnector capacity release plans. A steering committee comprising AEMO, ElectraNet and TransGrid has been established to:
 - a. Coordinate NEM integration studies between all parties;
 - b. Coordinate the development of a new coordinated SPS in consultation with other TNSPs and AEMO and ensure it will function to facilitate system security. AEMO to provide EFCS Setting schedule;
 - c. Facilitate market integration activities;
 - d. Consult with government, industry and jurisdictions on the proposed test program;
 - e. Ensure that all systems and processes are in place before energisation of the new interconnector to support release of interconnector transfer capability within a reasonable timeframe;
 - f. Support AEMO's appointed Inter-network Testing Officer during interconnector testing;
 - g. Update key stakeholders and market participants on progress and delivery on PEC transfer capability;
 - h. A test program shall be developed by ElectraNet and TransGrid, in consultation with AEMO, consisting of the following:-
 - i. Development of constraint equations and a capacity release plan. The test plan shall test the technical capability of the proposed interconnector at 800MW transfer capacity and ensure the release of staged increases in combined import and export transfers across both the Heywood and proposed interconnection within a reasonable timeframe;
 - ii. Ensure the required agreements, operating instructions and protocols are in place prior to testing and release of capacity to the market by AEMO;
- 3) Review and modify (if required) relevant existing protection and control schemes;
 - a. Emergency control schemes;
 - b. Special protection schemes;
 - c. Voltage control schemes and reactive switching control; and
 - d. Protection schemes.
- 4) Assess impact on relevant existing generators or load connections;
- 5) Assess impact on oscillatory stability, optimisation of OEM proposed Power System Stabilizer (PSS) settings and revise oscillatory stability limit advice as required;

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- 6) Development of operational support materials for the ongoing operation of the new plant, including:
- a. Support modification of AEMO's NEMDe (NEM Dispatch Engine) and other market systems;
 - b. Development of limit advice:
 - i. Limit equations to manage construction outages;
 - ii. New Limit equations for ongoing operation after project implementation accounting for the parallel Heywood and the new interconnector; and
 - iii. Generation Dispatch Limiter (GDL) equations - where relevant.
 - c. Updating of operating instructions for control room; and
 - d. Development of stability and constraint equations for managing outages.

8. Special Protection Scheme

A Special Protection Scheme (SPS) is required to manage the risk that, for a non-credible (and very low probability) loss of either of the two double circuit interconnectors that will be in place once Project EnergyConnect is commissioned under high power transfer conditions, the other interconnector could overload, cause instability and result in separation of South Australia from the NEM and a potential widespread loss of supply.

ElectraNet has prepared a concept design for the SPS¹, which has highlighted the complexity of design and implementation to include a multitude of circuits and connection points (generators and loads). These connection points will be monitored for detection and response and address the risk that, under high power transfer conditions, the loss of either the existing Heywood interconnector or this interconnector could cause the other to overload.

The SPS will be modelled for various operating scenarios using different detection and response approaches, to determine the appropriate solution, to inform the design of the scheme.

This scheme will require studies to be coordinated between ElectraNet, TransGrid, AusNet, and AEMO. Contracts with participating generators may also be required, to be included in the SPS.

Other stakeholders such as the Office of the Technical Regulator and SA Power Networks will be engaged during the process of development and approval of the scheme. A Steering Committee will be setup to coordinate the inputs into system integration, award a proficient consultant to provide a functional design and the award of an EPC (Engineer, Procure and Construct) contract to install the scheme across the three states. The SPS scheme would take various actions, depending on the direction of power flow and other system conditions, which will include load shedding, discharging of battery systems, or tripping generation plant.

Multiple monitoring points and action stations will be installed at substations across the three states to provide the required data to act should an interconnector be lost.

The figure below shows the concept high level overview of the SPS architecture.

¹ For further information, see ElectraNet, [SA Energy Transformation RIT-T Special Protection Scheme](#), 22 May 2019.

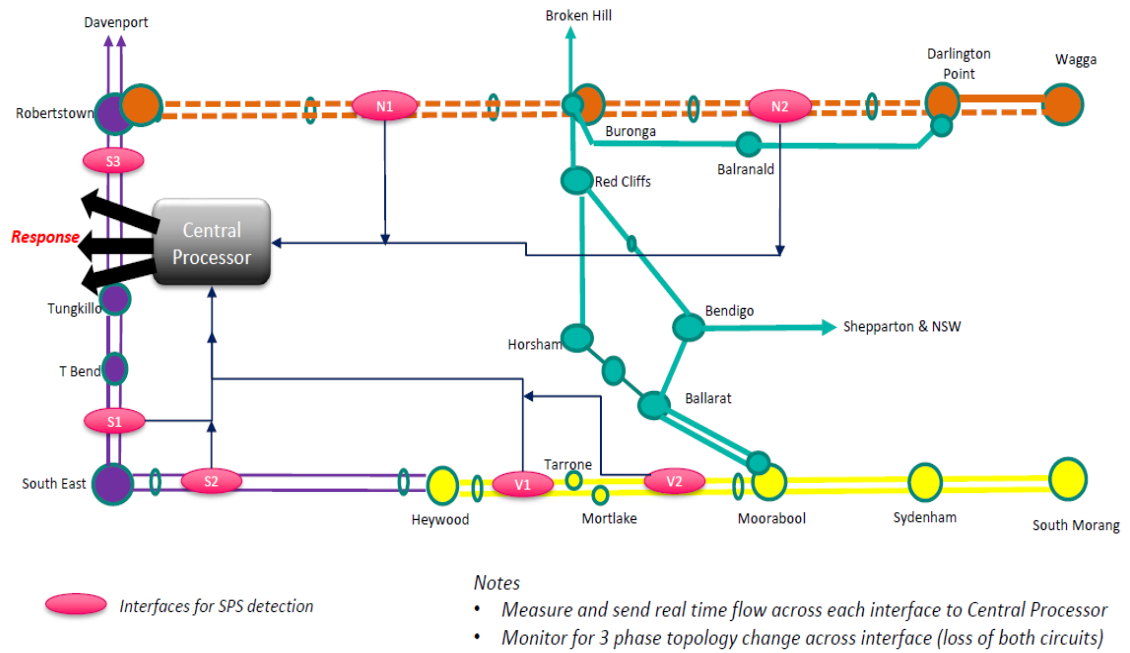


Figure 2: Proposed SPS architecture