3.0 PROJECT DESCRIPTION

3.1 PROJECT LOCATION

The proposed Western Downs Substation site and line connection project is located on the Banana Bridge Road at Hopelands, approximately 24km south east of Chinchilla and 64km west-north-west of Dalby on the Darling Downs in Southern Queensland. The site is adjacent to properties containing the Kogan Creek Power Station and associated developments.

The substation site is located within the local authority of the Western Downs Regional Council and the Warrego State Electorate.

Figure 1.1 indicates the Braemar / Kogan Creek / Tarong locality. This area lies within Powerlink's South West Queensland (SWQ) network sector.

3.2 DESCRIPTION OF THE PROPOSED SUBSTATION

The project consists of the development of a substation which in its ultimate form will contain a 275kV switchyard, a 500kV switchyard, transformers for the conversion of power between the two voltages, static var compensator (SVC) units, capacitor banks, overhead structures to support wires and busbars, an oil separation system, control buildings, connections to the transmission network, communications and control systems, access roads and associated infrastructure. The first stage of the development will comprise a 275 kV switch yard and the connection of this facility to the existing Braemar to Kogan Creek 275kV transmission line using double circuit transmission lines supported on steel lattice towers, steel or concrete poles.

The development of any future transmission lines out of the substation site will require the completion of an EIS to identify the routes together with an EIS for the individual line/s.

3.2.1 Substation

An electrical substation is the component of the high voltage electrical supply network where the voltage of incoming bulk supply electrical power is transformed to a higher or lower voltage for transmission purposes. It is a marshalling point for incoming and outgoing transmission lines that provides fault detection and switching facilities for these lines as well as protection and transformation equipment within the substation.

A high voltage substation consists of a number of structures, items of equipment and support services including:

- Various items of electrical equipment circuit breakers, isolators, power transformers and instrument transformers each mounted on individual support structures;
- Circuit breakers which will utilise conventional switchgear pressure sealed and gas insulated (by sulphur hexafluoride - SF_6);
- Capacitor banks and Static Var Compensators for optimizing transmission efficiencies;
- Gantry structures between which are strung conductors to transport power between items of equipment;
- Busbars which transport power from one set of equipment to the next;

- A waste water collection system which incorporates oil separation facilities,
- Access roads,
- Line connections to the transmission network, and
- One or more buildings which house control, protection and communications equipment.

The structures and equipment are set out in 'bays', where one bay is required for each transformer or for each circuit of an incoming or outgoing transmission line.

3.2.2 Line connection to the Kogan Braemar Transmission Line

A 275kV double circuit transmission line will connect the existing Kogan Creek Braemar Transmission line to the Western Downs Substation.

3.2.2.1 Supporting structures

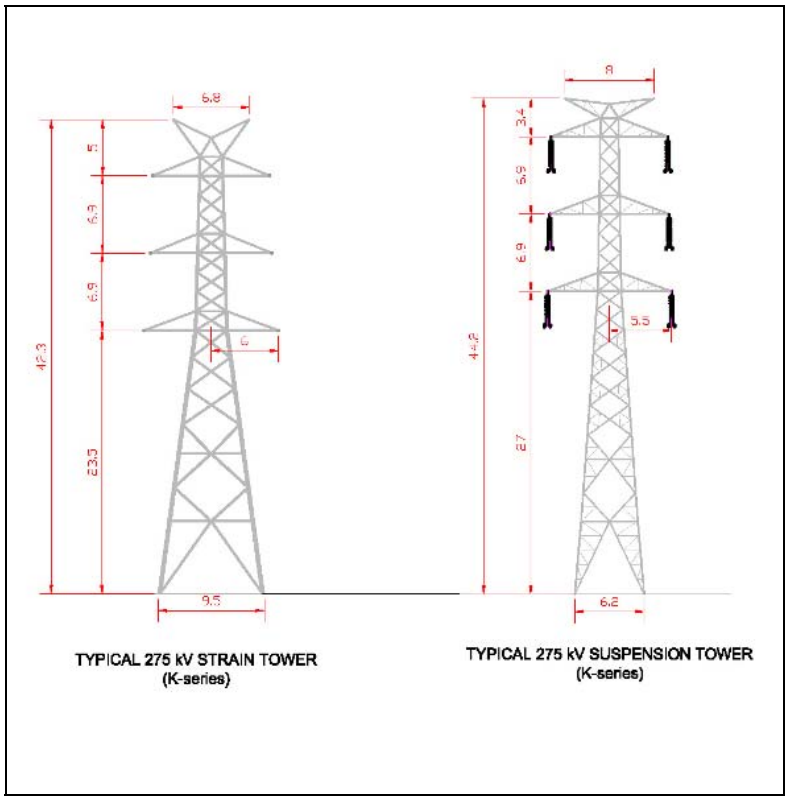
Supporting structures are used to keep the high voltage conductors separate from each other, clear from the ground and other obstacles. Supporting structures can be steel lattice towers, concrete poles or steel poles. The type and materials for the connection to the existing transmission line will be chosen during the detailed design. The individual components for steel lattice towers are fabricated from galvanised steel angle sections (members) and steel plate and these are then bolted together into a 'lattice' structure. Bored, or mass concrete foundations support the four legs of each tower. Tower heights are nominally 42 metres however this can vary depending on the structure spacings and required heights of the lines.

Poles can be constructed from rolled steel or cast reinforced concrete. Line hardware including insulators or cross arms are then bolted to preinstalled flanges at the appropriate height on the poles. Pole foundations can be bored, or mass concrete depending on ground conditions. Poles can be self supporting, or require guy wires. Pole heights are somewhat lower than towers being 20m – 35m.

Outlines of lattice tower designs are illustrated in Figure 3.1.

Minimum clearance requirements between energised conductors and various types of obstacles are specified by the *Electricity Regulation 1994*.

FIGURE 3.1 LATTICE TOWER DESIGNS



3.2.2.2 Conductors

Conductors to be used on the proposed line will be Aluminium Alloy Conductor. The conductors will be approximately 36 millimetres in diameter. Each structure will support twelve individual conductors, in bundles of two, and two earth wires. Electrical continuity on tension structures is provided by 'bridging conductors' which are suspended beneath the crossarms, connecting the terminated conductors on either side of the tower. Where necessary, these conductors are restrained by 'bridging insulators' to maintain electrical clearance.

3.2.2.3 Earth Wires

Two overhead earth wires provide protection to the conductors from direct strike by lightning and are also used as support for optical fibre cables for communications purposes. The optical fibre earth wires will typically be 14 millimetres in diameter with the optic fibre protected within the middle of the cable.

3.2.2.4 Insulators and Other Fittings

Insulators are used to physically attach the conductors to the support structures and to provide electrical insulation between the high voltage of the conductors and the (earthed) structure. The length of the insulators depends on line voltage, clearance requirements and environmental (e.g. pollution) considerations. Special galvanised steel fittings connect both the line end of the insulator to the conductors and the tower end to the structure. Glass or porcelain insulators will be used.

3.3 CONSTRUCTION, MAINTENANCE AND DECOMMISSIONING ACTIVITIES

3.3.1 Construction

Construction of the proposed Western Downs Substation will involve a series of activities including:

- A detailed site survey including geotechnical studies to allow detailed structure and substation design;
- Vegetation clearing;
- Civil Works:
  - Bulk earthworks to achieve the necessary drainage and flood attenuation;
  - Earthwork and levelling for the substation platform and access road;
  - Installation of site drainage system;
  - Installation of substation cable trench and conduit system;
  - Installation of the substation earthing mat;
  - Installation of substation structure and building foundations; and
  - Site fencing;
- Component installation including structures, electrical equipment and control buildings
- Installation of the cabling, operating and control systems;
- Tying in to the existing network; and
- Commissioning.

3.3.1.1 Vegetation Clearing

The proposed location of the substation contains some woody vegetation and is mapped by the Queensland Herbarium as 'remnant, not of concern' (see Section 10.2). It is proposed that the site clearing will be by bulldozer and cleared material will be stacked for later disposal by burning or chipping. The clearing for the line connection may be undertaken by megamulcher to minimize soil disturbance. The clearing strategy and vegetation disposal techniques will be detailed in the Construction EMP.

Revegetation of areas outside the substation footprint will be a consideration to reduce the visual amenity of the site from a nearby residence to the west (see Section 15.2).

3.3.1.2 Civil Works

The civil works involve the installation of substation drainage, roads, cable trenches, substation earthing, structure foundations and security fencing.

Bulk earthworks will be undertaken to prepare the site pad at the required level and grade.

A copper electrical earthing mat is installed across the site at a depth of approximately 600 millimetres. The disturbed soil will then be compacted and covered in road base material to prevent erosion. The overall site is then covered in gravel. Drainage work consists of the installation of all drains, pits and culverts necessary to control the flow of stormwater from the site. The drainage system includes the installation of an oil skimmer to ensure run-off water is not contaminated. All roads into the substation compound and equipment area will be constructed to a standard appropriate for the anticipated loads and traffic flows.

Structure, equipment and building foundations will be bored, excavated, or a combination of both. Bored concrete foundations are used in most situations whilst excavated foundations are used where pad type footings are required. Isolated concrete plinths and foundations will then be constructed to support the site infrastructure. Supply of the concrete for foundations will be from a local commercial batching plant, or a plant established specifically for this project.

The substation will be surrounded by a 2.4 metre-high chainwire security fence, topped with several strands of barbed wire. Gates will be provided to allow entry by authorised vehicles and personnel.

3.3.1.3 Installation and connection of Electrical Equipment and Control Systems

All gantry and support structures are erected using mobile cranes. The busbars and high voltage electrical equipment are then placed in position and all electrical connections made. Conductors are strung between the high-level gantries and connected to the high voltage equipment.

Cables that carry the control and protection signals to the control equipment located in the buildings are then laid and connected. The final connection is that of the transmission lines connecting the substation to the existing network. The substation is then energized and the control systems commissioned. Once the suitability of the substation in confirmed, it is brought on line.

3.3.2 Operation and Maintenance

After the completion of construction and commissioning of the substation, the amount of activity on site will decrease substantially as the substation is designed to be monitored and controlled remotely. For safety and security reasons, only authorised personnel are permitted access to the substation compound. Remotely controlled security cameras will be installed as remote video monitoring of the substation enables a quick response to any issues that may arise.

Facilities exist for manual and emergency site control, should this be necessary. Maintenance staff will carry out routine inspections of the substation and detailed maintenance of all plant equipment at regular intervals. Additional inspections may be required as a result of equipment failure, modifications and upgrades or vandalism. During the routine inspections, all areas of the substation and all items of the plant are assessed. Faults and defects will be reported to maintenance staff who will then rectify any problems identified. Substation equipment is designed with a service life of approximately 40 years and is very reliable under most conditions. Apart from the detailed visual inspections that maintenance that staff perform, routine maintenance will be carried out every four to six years depending on the type and make of the plant equipment.

Vegetation regrowth control within the substation compound and under the incoming power supply transmission lines will be undertaken to maintain electrical safety clearances between the conductors and vegetation.

3.3.3 Decommissioning Details

The design lifespan of a substation is in excess of 50 years. This is a nominal period which can be extended by focused, life extending maintenance, upgrades and rebuilds. Should it be determined that decommissioning is required, a comprehensive environmental management plan would be prepared to comply with legislative, environmental, land management and other requirements applicable at that time.

The extent to which the site is rehabilitated would be dependant upon the desired outcomes and proposed future use of the land. Typically, all structures, equipment, buildings and electrical components would be removed for appropriate recycling. Concrete footings would be left in situ, or cut off below ground level with the lower end of the footing remaining in place. Any material which could not be recycled would be disposed of on site (if acceptable), or removed to an appropriate waste disposal facility.