South Australia’s public transport system is receiving a major overhaul, with a program of works now underway to progressively transform Adelaide’s rail network into a vibrant, state of the art and sustainable system, providing faster, cleaner, more frequent and efficient services for commuters.

Rail electrification will be rolled out on the Adelaide to Seaford and Tonsley rail lines, with Adelaide’s first electric trains arriving for testing in June 2013.

What is electrification?

Currently, all of our trains are powered by diesel. Electrifying the Adelaide to Seaford and Tonsley lines will involve installing masts and overhead electrical wires. These wires will power brand new electric trains.

Works program

The works to electrify the lines will include:
> installation of masts and a 25kV ac overhead wiring system
> construction of substations connected to the SA Power Networks 66kV grid to power the electrified system
> relocation of services (mostly existing 11kV overhead electricity cables) where they currently span the rail corridor; and
> rail signalling and communications systems.

The electrified system to be installed on these lines is similar to the system that operates successfully in Brisbane and Perth, and many other locations around the world.
There is a selection of structures that will be used to support the overhead wiring. The type of structure used will be determined by a number of factors, including the configuration of the track, ground conditions, environmental conditions, adjacent vegetation and sighting of signals for train drivers.

### Concrete Masts
The majority of masts in two track areas are made from concrete and are typically 8 metres tall. These masts normally support 4 wires. The return conductor and the earth wire will be attached directly to the mast. The contact wire and the catenary wire will be held above the track using a cantilever attached to the mast.

### Spacing of overhead wiring supporting structures
Generally along the corridor, where the track is straight, the spacing between overhead line structures is typically 50 metres. However the spacing between masts is reduced in areas with high wind and / or where the track goes around curves – typically in the range of 25-40 metres. The spacing of structures will also be influenced by the track layout. For example in the Adelaide Yard where there are numerous points and crossings, the spacing of structures has been reduced considerably due to the change in direction of the overhead wire.

### Overlaps
The typical length of an overhead wire run is 1600 metres. An overlap is where one length of overhead wire comes to an end and a new length of overhead wire starts. To ensure there is continuity in the system the first length of overhead wire does not come to an end where the new overhead wire starts, but the two wires run parallel to each other (or “overlap”) over a distance of approximately 50 metres. In order to support the two sets of overhead wires through the overlap, twin masts are installed two metres apart at both ends of the overlap.
There is a selection of structures that will be used to support the overhead wiring. The type of structure used will be determined by a number of factors, including the configuration of the track, ground conditions, environmental conditions, adjacent vegetation and sighting of signals for train drivers.

**Concrete Masts**

The majority of masts in two track areas are made from concrete and are typically 8 metres tall. These masts normally support 4 wires. The return conductor and the earth wire will be attached directly to the mast. The contact wire and the catenary wire will be held above the track using a cantilever attached to the mast.

**Portal Structures**

A portal structure consists of two steel legs supporting a steel beam and resembles a soccer goal in appearance. Portal structures are used when there are multiple tracks to span and there is not enough space between tracks to install individual masts. Portals are also used when there are multiple overhead wires to support, for example above junctions. They are also used when ground conditions are unsuitable for single masts.

**Twin track cantilever**

A twin track cantilever consists of a steel mast that supports a steel beam that spans over two tracks. This allows for the overhead wiring for the two tracks to be supported from one side of the track. A twin track cantilever would typically be used if there was an obstruction to prevent a footing from being installed on one side of the track, or if the installation of masts on one side of the tracks would obscure the train driver’s view of signals.

**Structure with anchors**

Some masts / portals will have a guy rope attached to the top and an additional footing located approximately 7.5 metres away. This arrangement is used when an overhead wire is anchored onto that structure. For example, a guy rope and the additional footing prevent the tension in the anchored wire from pulling the structure over.

**Balance weight anchors**

Balance Weight Anchors are used to anchor contact and catenary wires. In addition to the guy rope, a set of weights will hang from the structure and are used to provide a constant tension and to take up the expansion and contraction in the wires due to changes in temperature. The weights apply tension to the wire through a 3:1 pulley system.

**Other types of structures**

In certain locations the masts and portals will support other equipment needed for the operation of the overhead wiring system. These could include switching structures, used to turn power on and off to different electrical sections, feeder structures, where cables are used to transfer electric power to the overhead wires, or structures used to transfer electric power from the overhead line to track side transformers.
Benefits of electrification

Along with the purchase of new trains, timetable changes and track upgrade works, electrification will deliver a more modern and efficient train service. Services will be quieter, faster and more frequent.

Environmental
Environmental benefits include:
> reduced noise
> reduced vibration
> reduced local air pollution.

Energy efficiency
An electrified rail network:
> is much less reliant on imported fuels.

Road users
More people are expected to use the electrified rail network, which may lead to:
> fewer cars on the road
> cost savings due to more efficient traffic flows
> reduced travel time.

Fencing of the corridor

As part of these works, fencing along the corridor is being installed or upgraded where required to reduce trespass.

As you may be aware, many sections along the rail corridor are already fenced. Any existing fencing that meets height requirements and is in good condition will not be removed or impacted. Repairs will be made to chain mesh fencing and additional mesh fencing installed where required.

New mesh fencing will be 1.8m high and use black wire in residential areas to reduce the visual impact.

Unauthorised access points from residential properties into the rail corridor will need to be sealed. In some areas, trees and bushes may also be trimmed or removed to facilitate fence installation, and fence lines may need to be adjusted. Any alterations to property boundaries will be done in full consultation with affected property owners. If you have any concerns or enquiries in the interim, please do not hesitate to contact the project team on the information line (1800 644 735).

Spear fencing will continue to be used at rail stations and high risk trespass areas.

Screening at road bridges and pedestrian overpasses is also being installed to restrict people from being able to come into contact with overhead wires.

Fencing works will generally occur during normal working hours of 7am to 6pm from Monday to Saturday and Sunday from 9am to 5pm, and will be done in consultation with affected properties owners.

for further information visit
To ensure a safe and efficient passenger rail network, vegetation needs to be kept clear of the 25kV overhead wiring system. The Department of Planning Transport and Infrastructure (DPTI) has developed a policy that is consistent with electrified rail systems in other states and is similar to vegetation control activities undertaken by electricity distributors in South Australia.

Vegetation clearance zones and maintenance buffers are being established as part of the rail electrification works, in order to:

> minimise the risk of tree limbs falling on the track or damaging overhead wires; and

> reduce the extent and frequency of vegetation maintenance and any resultant service disruptions to undertake these activities.

DPTI is required to obtain Development Approval for the removal or pruning of any Regulated/Significant Trees as defined by the Development Act 1993.

You can expect to see vegetation management activities occurring during the construction phase of this project. Vegetation removals and pruning have already commenced and will continue over the coming months.

Any tree hollows found in trees identified for removal or pruning will be relocated to protect the habitat value they provide for local fauna. Pest plants within the rail corridor will also be managed as part of these works.

DPTI is working closely with local councils to assess all vegetation impacts and to plan how and identify where DPTI can replant (offset) vegetation, in suitable areas to minimise the impact.

**New planting guidelines**

In order to provide a landscaped environment in proximity to the electrified rail corridor while maintaining safety, the following guidelines for new plantings apply:

The **EXCLUSION ZONE**: 3 metres (in any direction) from the ‘live’ electrical infrastructure. This area will be kept free of all vegetation.

The **VEGETATION CLEARANCE ENVELOPE**: 5 metres from the ‘live’ electrical infrastructure. This envelope will be regularly cleared of any vegetative material by DPTI to safely maintain the Exclusion Zone.

**ZONE 1**: The maintenance zone between 3 and 5 metres of the ‘live’ electrical infrastructure. Plantings will be at the discretion of DPTI and will be limited to low groundcovers or grasses.

**ZONE 2**: Between 5 and 10.5 metres from the ‘live’ electrical infrastructure. Vegetation species will not exceed 5 metres high and 5 metres wide when mature.

**ZONE 3**: Between 10.5 and 14 metres of the ‘live’ electrical infrastructure. Vegetation species will not exceed 9 metres high and 9 metres wide when mature.
In selecting plant species for the vegetation zones adjacent to the electrified rail corridor, it is important for local councils and adjacent residents to consider the planting location given the mature species height & width to prevent growth into the VEGETATION CLEARANCE ENVELOPE and EXCLUSION ZONE.

The following tables provide suggested vegetation species that may be planted appropriately in the vegetation zones adjacent to the electrified rail corridor. Individual local councils may have specific planting requirements for your area. Please consult your local council prior to planting.

<table>
<thead>
<tr>
<th>Zone 2 suggested vegetation species</th>
<th>INDIGENOUS IN S.A.</th>
<th>NATIVE</th>
<th>EXOTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(plant species that do not exceed 5m high and wide)</td>
<td>Acacia acinacea (Gold Dust Wattle)</td>
<td>Dianella species (Flax Lily)</td>
<td>Albizia x grandiflora (Glossy Abelia)</td>
</tr>
<tr>
<td></td>
<td>Acacia paradoxa (Kangaroo Thorn)</td>
<td>Banksia ornata (Desert Banksia)</td>
<td>Ceanothus species (Californian lilacs)</td>
</tr>
<tr>
<td></td>
<td>Bursaria spinosa (Christmas Bush)</td>
<td>Correa species (Correas)</td>
<td>Metrosideros excelsa (New Zealand Christmas Tree)</td>
</tr>
<tr>
<td></td>
<td>Dodonaea viscosa (Sticky Hop Bush)</td>
<td>Callistemon ‘Captain Cook’ (Bottlebrush)</td>
<td>Murraya species (Murraya)</td>
</tr>
<tr>
<td></td>
<td>Eremophila species (Emu bush)</td>
<td>Alyogyne species (Native hibiscus)</td>
<td>Photinia species (Photinia)</td>
</tr>
<tr>
<td></td>
<td>Hardenbergia violacea * (Native lilac)</td>
<td>Kennedia nigricans * (Black Coral Pea)</td>
<td>Raphiolepsis indica (Pink Hawthorn)</td>
</tr>
<tr>
<td></td>
<td>Olearia ramulosa (Twiggy Daisy Bush)</td>
<td>Senna species (Cassias)</td>
<td>Trachelospermum jasminoides * (Star Jasmine)</td>
</tr>
<tr>
<td></td>
<td>Rhagodia parabolica (Mealy Saltbush)</td>
<td>Westringia species (Native rosemary)</td>
<td>Viburnum species (Viburnum)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zone 3 suggested vegetation species</th>
<th>INDIGENOUS IN S.A.</th>
<th>NATIVE</th>
<th>EXOTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(plant species that do not exceed 9m high and wide)</td>
<td>Acacia melanoxylon (Blackwood)</td>
<td>Adenanthos sericeus (Woolly Bush)</td>
<td>Elaeocarpus reticulatus (Blueberry Ash)</td>
</tr>
<tr>
<td></td>
<td>Allocasurina verticillata (Dropping Sheoak)</td>
<td>Banksia integrifolia (Coastal Banksia)</td>
<td>Fraxinus griffithii (Ash)</td>
</tr>
<tr>
<td></td>
<td>Banksia marginata (Silver Banksia)</td>
<td>Callistemon ‘Harkness’ (Gawler Hybrid Bottlebrush)</td>
<td>Jacaranda mimosifolia (Jacaranda)</td>
</tr>
<tr>
<td></td>
<td>Caliltra gracilis (Southern Cypress Pine)</td>
<td>Corymbia ficifolia ‘dwarf forms’ (Red Flowering Gum)</td>
<td>Lagerstroemia species (Indian Summer Crepe Myrtle)</td>
</tr>
<tr>
<td></td>
<td>Eucalyptus incrassata (Ridge Fruited Mallee)</td>
<td>Cupaniopsis anacardioides (Tuckeroo)</td>
<td>Melia azedarach Seedless Form (White Cedar)</td>
</tr>
<tr>
<td></td>
<td>Melaleuca decussata (Cross Leaf Honey Myrtle)</td>
<td>Eucalyptus leucoxylon ‘eucy dwarf’ (Dwarf Blue Gum)</td>
<td>Pistacia chinensis (Chinese Pistachio)</td>
</tr>
<tr>
<td></td>
<td>Myoporum monatum (Native Mrytle)</td>
<td>Eucalyptus torquata (Coral Gum)</td>
<td>Pyrus species (Ornamental Pear)</td>
</tr>
<tr>
<td></td>
<td>Pittosporum angustifolium (Native Apricot)</td>
<td>Hymenosporum flavum (Native Frangipani)</td>
<td>Sophora japonica (Japanese Pagoda)</td>
</tr>
</tbody>
</table>
Electrification of Adelaide’s rail network forms part of the State Government’s unprecedented and ongoing investment in public transport. Together with the delivery of Australia’s most modern and safest new train fleet, an electrified network will result in a vastly more modern, environmentally friendly and efficient train service.

The electrification of the southern rail network involves installing masts and overhead wires along more than 37km of track between Adelaide and Seaford (including the Tonsley line).

Electrification safety

As with all rail networks safety is paramount during both construction and operation of an electrified system.

It is important to remember that as a responsible and safety conscious user of the existing rail network you don’t need to do anything different to safely use an electrified system.

However there are unique features of an electrified rail system that you should be aware of.

Most noticeable will be screening (where physical barriers are placed between electrical infrastructure, such as overhead wires and fittings, and people) and access restrictions that ensure people using the trains or living nearby will not be at risk.

While the system will not be fully energised until all infrastructure is in place, once installed, the overhead wires and their fittings should be considered live (and carrying current) at all times.

All wires will be housed within the rail corridor, they should be treated as live and you should apply the same respect and safety consciousness you do with suburban power poles.

Safety infrastructure to be installed and safety measures being taken include:

- Screening at road bridges and pedestrian overpasses to restrict people from being able to come into contact with the overhead wires.
- Upgraded fencing along the corridor to reduce trespass.
- Access to stations will be via overpasses and/or dedicated pedestrian paths only.
- Unauthorised access from residential properties into the corridor will be sealed.
- Signage across the network to reinforce safety messages to passengers, cyclists, motorists and pedestrians.
Catching a train at the station

The new electric trains will look and sound different to current diesel trains so you will need to familiarise yourself with how these new trains operate. If you follow the usual safety precautions needed at any train station you will be safe.

It is important to stand behind the yellow tactiles because the new trains will be quieter and faster and may not be stopping at all stations.

Always use the dedicated pedestrian footpaths to access railway stations.

If you have children make sure they are aware of the dangers of the electrical wires. Make sure they know not to play or walk near the train tracks.

Only cross at level crossings and at recognised pedestrian crossings. Don’t take shortcuts along or across the railway tracks.

The presence of overhead wires means changes for some road users at level crossings, with the introduction of height restrictions at level crossings on Adelaide’s roads within the electrified network.

Electric rail services are coming to Adelaide in 2013/2014: You should

- Continue to use the rail network responsibly.
- Understand any changed conditions arising from an electrified rail system.
- Stay Switched On when you interact with the rail network.

Further information

If you have any questions about the electrification project please:

- call 1800 644 735
- email dpti.electrification@sa.gov.au

1. Insulators
   To separate ‘live’ equipment from masts.

2. Overhead wiring
   To transmit electrical energy to trains.

3. Pantograph
   This is the frame on the top of electric trains, it contacts with the overhead wires that are connected to the power supply.

4. Cantilever arms
   To support the overhead wiring system.

5. Masts
   Made from concrete, masts will be approximately 50 metres apart and 8 metres tall.

6. Other live wires
   Return conductor and earth wires are also live.