Western Power operates the transmission and distribution assets of the South West Interconnected System (SWIS), serving more than one million customers across a network area of 255,000 km².

Our core business is focused on transporting electricity to the communities across the SWIS safely, reliably and efficiently.

Our business provides an essential service that underpins the economic competitiveness of the SWIS and supports customers’ electricity demand.

Part of our strategy for the future is to develop new solutions to the changing environment.

Increasingly, we are acting as a platform for retail and residential customers to choose how they want their electricity supplied and delivered.
Our service area of 255,000 km²:

» is bigger than Great Britain (244,800 km²)
» contains 100,303 km of circuit wire – two and a half times the Earth’s circumference (40,075 km)
» is geographically vast - and average of one customer per square kilometre

255,000 km²

100,303 km circuit wire
811,773 poles & towers
17,047 GWh electricity transported
We are planning for the future

Annual planning in 2017

Western Power’s Annual Planning Report (APR) highlights network investment opportunities and describes emerging capacity constraints on our network.

The document highlights opportunities for third parties to propose efficient and effective solutions to these constraints.

The Report demonstrates how we use our strategic network planning process to responsibly and efficiently manage the network. It also discusses how we seek and integrate network solutions to maintain service levels and where necessary improve these to meet customer needs.
Why is planning important?

The 2017 APR has a five year outlook, based on historical data, and studies:

» energy demand forecasts
» future generation needs
» transmission and distribution network developments and projects, and
» estimated maximum fault levels at each substation to ensure a suitable rating of the network’s and customers’ equipment.

Planning and partnerships

The APR complements the Australian Energy Market Operator’s (AEMO) 2017 Electricity Statement of Opportunities.¹

Together with our forecasting and planning data, this information provides valuable insights into current and future opportunities for existing and new generators, large businesses, developers and consumers. It helps us to better understand current generation constraints, capacity changes from energy generators, potential major asset challenges and innovative and viable solutions for our transmission and distribution networks.

¹ AEMO is responsible for operating the wholesale energy market for the SWIS and manages the purchase and sale of energy by producers, retailers, traders and large consumers.
Forecasting the future

Our forecasting reflects the challenges our industry is facing, such as the significant uptake of solar PV systems, electric vehicles (including plug-in hybrids), increases in electricity prices and more energy-efficient buildings and electrical appliances.

An annual 10 year peak demand forecast helps us track changes in demand, reveals year-to-year network risks and identifies development opportunities. This forecast is based on both historical trends and key underlying factors such as weather, population growth, economic cycles, changing consumer behaviour and tariff charges, the take-up of energy efficient products and future technological advances.

For more details, please see Section 3 of the APR.

Changes in our network system peak loads

Western Power is working with Synergy and the AEMO to ensure electricity supply continues to be safe and reliable.

We are embracing this changing environment and are transforming how we plan, build and operate our network. New technologies and customers who are more conscious of their energy source are also driving new renewable energy sources and non-traditional solutions.

An ever changing environment

Last year the State Government directed Synergy to reduce its generation cap and the business is doing this by retiring four generation assets.

The traditional energy service business model – a network of assets that delivers electricity one-way – is no longer the norm. Now, networks have to manage bi-directional flow.

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For more details, please see Section 3 of the APR.
Demand opportunities are growing

Electricity usage is intrinsically linked to technological advancements.

An example of this is the now common use of residential air conditioners. In the late 1990s and early 2000s, demand for power increased rapidly, as the majority of Western Australian’s installed air conditioners.

Today, load growth is still increasing, but at a declining rate. It is likely to continue to increase in line with population growth, which generally results in new community services like hospitals, schools, businesses and shopping centres.

There are three network extension projects underway in areas which are showing significant growth: Waikiki, Henley Brook and Busselton. We are planning to install new transmission cable in the Perth CBD, to connect Hay Street and Milligan Street substations. And there are a number of planned projects in the eastern Goldfields region, including new transformer and STATCOM installations, which will increase capacity in the area.

Completed and committed projects are on pages 12 - 15 or see Section 8 of the APR for more details.
Increasingly, we are acting as a platform for business and residential customers to choose how they want their electricity supplied and delivered.

During the next five years, we will be making network changes to support customer needs.

Specifically, we are considering not just augmentation of the network, but also non-traditional options, such as demand management, local generation and non-standard connections.

We see our role as laying the foundations for industry change and we expect many opportunities for others in the industry to join us.
The two maps shown here indicate specific locations where network constraints exist and can be used to identify opportunities for future load and generation connections. More information is in Section 6 and 7 of the APR.

At the moment, we are assessing a number of renewable generation proposals and in the next few years we expect to connect several hundred megawatts of transmission renewable generation.

To discuss specific opportunities to connect to our network, please contact the Access Solutions Manager at: customer.connection.services@westernpower.com.au
Connecting to our distribution network

There are also opportunities to connect to our distribution network.

In the past 12 months, we have seen a significant increase in commercial solar systems applications.

We have recently made changes to our policies to increase the capacity threshold for a subset of generators which have been deemed as not constrained and non-competing for transmission capacity.

The threshold has increased from less than 150 kVA to less than 1 MVA installed capacity and applies to inverter connected distribution generators, such as many commercial solar systems.

This improves application processing times and cost, while maintaining network reliability and safety. Specific areas deemed at risk (see APR Section 6.20.1 and 7.5) may require further assessment.

We have recently made changes to our policies to increase the capacity threshold for some generators.
The estimated capacity of inverter-connected generators connected to our distribution network.

For further information please refer to the Applications and Queuing Policy and the APR, or contact the Access Solutions Manager at: customer.connection.services@westernpower.com.au
Paving the way for the future

Our network development planning process helps to maximise the value of the network and prepare for coming technological changes. This process identifies improvements we can make now, to provide an efficient, reliable and competitive network service for customers.

Since the 2015/16 APR, we have delivered a range of network investments which address network issues.

We have also committed to a range of upcoming projects which will help meet reliability demands while continuing to provide a high quality service.

Please refer to Sections 6 and 7 of the APR for more details.

Completed projects

Zone substations

PERTH CBD: Joel Terrace substation conversion from 66 kV to 132 kV to improve safety and reliability. Transfer distribution feeders to enable staged work on voltage conversion.

PERTH METRO: Established the Medical Centre 132-66/11 kV substation and the new Shenton Park 132/11 kV substation. Facilitates the future decommissioning of University, Herdsman and Nedlands substations and the recent decommissioning of the old Medical Centre substation.

MOORA: Replaced a 132/33 kV transformer with a higher capacity transformer at the Moora Substation.

WEST KALGOORLIE: Replaced switchboard at the West Kalgoorlie substation.

BUNBURY: Replaced a 132/22 kV transformer at the Bunbury Harbour substation.

MARGARET RIVER: Installed a new 132-66/22 kV transformer at the Margaret River Substation.

PERTH METRO: Refurbished the switchboard at Mason Road substation and resupplied British Petroleum from Mason Road substation.
Distribution feeder network projects

PROTECTION REVIEW AND UNDER - FAULT RATED CONDUCTOR MITIGATION PROGRAM: Albany, Bridgetown, Busselton, Bunbury (Stage 1), Kondinin, Wagerup, and Perth metro (Darlington, Hazelmere, Kalamunda, Wanneroo and Yanchep).

BUSSELTON: Reinforced distribution network.

PERTH CBD: Reinforced the distribution network at the Forrest Avenue substation.

PERTH METRO: Installed new feeders and reconfigured the network at Manning Street substation.

PERTH METRO: Converted the Medical Centre and University substations distribution networks to 11 kV to accommodate new transformer in Medical Centre substation.

NORTHAM: Reinforced the single phase feeder and installed an isolation transformer.

PERTH METRO: Transferred four feeders from British Petroleum substation to Mason Road and Medina substations.

SOUTH COUNTRY: Installed isolation transformers.
Key committed projects

Transmission works

BUSSELTON and PINJARRA: Install switches on the Pinjarra-Kemerton-Picton-Busselton 132 kV line.

KALGOORLIE: Install additional special protection schemes on Eastern Goldfields transmission network to relieve rotor angle stability issues, and replace SVCs at West Kalgoorlie terminal substation.

MUJA: Replace 220/132 kV bus tie transformer at Muja terminal substation with a new unit.

PERTH METRO: Kwinana to Southern terminal partial de-mesh to reduce fault levels and relieve thermal limitations.

PERTH METRO: Resupply North Fremantle substation from adjacent substations and decommission the remaining fluid-filled cable section between North Fremantle and Edmund Street substations.

PERTH METRO: Replace under-fault rated equipment at Collier, Summer Street, Wembley Downs and Western terminal substations to mitigate fault level constraints.

PERTH METRO: Decommission the University, old Shenton Park and Herdsman Parade substations and partially decommission the Nedlands substation.

Joined transmission and distribution works

BUSSELTON: Partially convert the Busselton 66 kV to 132 kV substation to address degraded asset conditions and to accommodate increasing demand.

GERALDTON: Install a new transformer at the Rangeway substation and decommission the Durlacher substation.

PERTH METRO: Install a new transformer at the Meadow Springs substation.

We routinely assess the condition of transmission and distribution assets and the ability of the network to supply existing and future demand growth. The 2017 APR describes the current supply arrangements on the transmission and distribution network, the existing constraints and those forecast to emerge in the next five years. Committed transmission projects as at 31 December 2016. Please refer to Sections 6 and 7 of the APR for details.
## Distribution works

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
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<tbody>
<tr>
<td>BEVERLEY and YORK</td>
<td>Install a third voltage regulator to mitigate low voltage issues.</td>
</tr>
<tr>
<td>CAPEL and DONNYBROOK</td>
<td>Upgrade feeder to address thermal capacity supply issues.</td>
</tr>
<tr>
<td>NORTHAM and WUNDOWIE</td>
<td>Upgrade single phase capacity on the line.</td>
</tr>
<tr>
<td>PERTH CBD</td>
<td>Minimise excavation required for future cable installations as part of Perth City Link development plan.</td>
</tr>
<tr>
<td>PERTH METRO</td>
<td>Decommission the Shenton Park and Herdsman substations to address the degraded asset conditions.</td>
</tr>
<tr>
<td>PERTH METRO</td>
<td>Convert to 11 kV and reinforce the network at the Nedlands substation.</td>
</tr>
<tr>
<td>PERTH METRO</td>
<td>De-energise the North Fremantle substation and shift supply to adjacent substations to resolve transmission cable issues.</td>
</tr>
<tr>
<td>SOUTHERN CROSS</td>
<td>Upgrade substation regulator to address degraded conditions and to mitigate voltage issues.</td>
</tr>
<tr>
<td>TRANSFORMER OVERLOAD UPGRADE PROGRAM</td>
<td>Identify and replace distribution assets across the whole network performing beyond their design capacity.</td>
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</tbody>
</table>

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**Let’s work together**

A shared understanding of the industry’s future is crucial to ensuring we all not only succeed at our individual business goals, but together build a bright and sustainable future for Western Australia.

We would appreciate your feedback and ideas about forecast planning and changes impacting your business and customers.

For further information on our 2017 Annual Planning Report please visit: westernpower.com.au/about/reports-publications
Contact our team:
Head of Network Planning
GPO Box L921
Perth Western Australia 6842
Telephone: (08) 9326 6647
Comments can also be submitted by email to apr@westernpower.com.au or through our website.

Visit us:
Western Power
Head Office
363 Wellington Street
Perth WA 6000
Australia