Distribution Annual Planning Report 2013

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CONTACT
This document is the responsibility of the Asset Management Division within ActewAGL Distribution (ABN 76 670 568 688) (**ActewAGL**).

For all enquiries regarding the Distribution Annual Planning Report 2013 (**DAPR**) and for submitting any written comments, please contact Manager Asset Management Division at: planning@actewagl.com.au

REVIEW DATE
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Version Control

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20/12/2013	1.0	Branch Manager Asset Strategy and Planning	Draft Version
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Document Authorisation

Name:	**Stephen Devlin**
Position:	General Manager Asset Management
Date:	20/12/13

Name:	**Dennis Stanley**
Position:	Senior Branch Manager Asset Strategy and Planning
Date:	20/12/13

Glossary

ActewAGL	ActewAGL Distribution
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
DAPR	Distribution Annual Planning Report
DMP	Demand Management Process
DNSP	Distribution Network Service Provider
DR	Demand Response
DSES	Demand Side Engagement Strategy
DSM	Demand Side Management
DSMP	Demand Side Management Planning
EOI	Expression of Interest
HV	High voltage
MVA	Mega Volt Amperes
NER	National Electricity Rules
NPV	Net Present Value
PFC	Power Factor Correction
PoE	Probability of exceedance
RDSE	Register of Demand Side Engagement
RIT-(D)	Regulatory Investment Test (Distribution)
TAPR	Transmission Annual Planning Report
TOU	Time of Use
TUOS	Transmission Use of System
QOS	Quality of Supply
Utilities Act	ACT Utilities Act 2000

1 Introduction and Background

1.1 Purpose

The purpose of this Distribution Annual Planning Report (DAPR) is to provide information about ActewAGL's assessment and planning of its transmission and distribution capacity and ActewAGL's plans for augmentation of the distribution network to meet demand over the next five years.

This report also details how ActewAGL plans to meet predicted demand for electricity supplied through its transmission lines, zone substations and high voltage feeders and discusses the process to engage with non-network providers and customers to address network constraints and system limitations.

This report addresses the requirements under sections 5.12.2 and 5.13.2 of the National Electricity Rules.

1.2 ActewAGL Transmission and Distribution Network

ActewAGL Distribution is a joint partnership, established in October 2000, which is equally owned by SPI (Australia) Assets Pty Ltd and ACTEW Corporation Ltd via their respective subsidiary companies, Jemena Networks (ACT) Pty Ltd and ACTEW Distribution Ltd.

1.2.1 Operating Environment

ActewAGL provides electricity and gas services over a supply area of 2,358 square kilometres to 177,256 electricity and 129,413 gas customers, as of 30th June 2013, within the Australian Capital Territory.

ActewAGL is licensed under the *Utilities Act 2000 (ACT)* to provide electricity distribution services and electricity connection services. ActewAGL is registered as a Distribution Network Service Provider by AEMO and since August 2012 as a Transmission Network Service Provider.

The *National Electricity Law (NEL)* and *National Electricity Rules (NER)* are enacted in the ACT by the *Electricity – (National Scheme) Act 1997 ACT*.

The Australian Energy Regulator (AER) is responsible for economic regulation of the ACT electricity distribution and transmission networks. ActewAGL Distribution's current electricity network prices are set in accordance with the AER's final decision for the period 1 July 2009 to 30 June 2014.

Technical regulation is overseen by the Environment and Sustainable Development Directorate (ESDD) within the Australian Capital Territory Planning and Land Authority (ACTPLA).

ActewAGL is responsible for the operation, maintenance, planning and augmentation of the transmission and distribution system within the ACT. There are a small number of rural cross border high voltage lines feeding rural customers within NSW. Because of the presence of the Brindabella Ranges the developed electricity network is mainly confined to the Canberra urban and surrounding rural areas on the north east side of the ACT

1.2.2 ActewAGL Network Assets

ActewAGL's transmission network takes supply at three TransGrid connection points.

1. Canberra 330/132kV bulk supply substation
2. Williamsdale 330/132kV bulk supply substation
3. Queanbeyan 132/66kV bulk supply substation

These bulk supply stations are TransGrid owned network assets. ActewAGL network assets include the 132kV transmission lines, 66kV sub-transmission lines, 132/22/11kV and 66/11kV zone substations, 22kV and 11kV distribution feeders, 22kV and 11kV distribution substations, low voltage (230/400V) circuits and services to customers.

A brief summary of ActewAGL's network assets are shown in Table 1: ActewAGL Network Assets below.

Table 1: ActewAGL Network Assets

Asset Type	Nominal Voltage	Quantity
Transmission Lines	132kV	159 km Overhead 3km Underground
Switching Stations	132kV	2
Zone Substations	132/11kV & 22kV	11 + 1 mobile substation
	66/11kV	1
Feeders	66kV	7km Overhead
	22kV	2
	11kV	239
22/0.415kV Substations	22kV & 400V	18
11/0.415kV Substations	11kV & 400V	4953

A geographic layout of ActewAGL's transmission network is detailed in Figure 1.

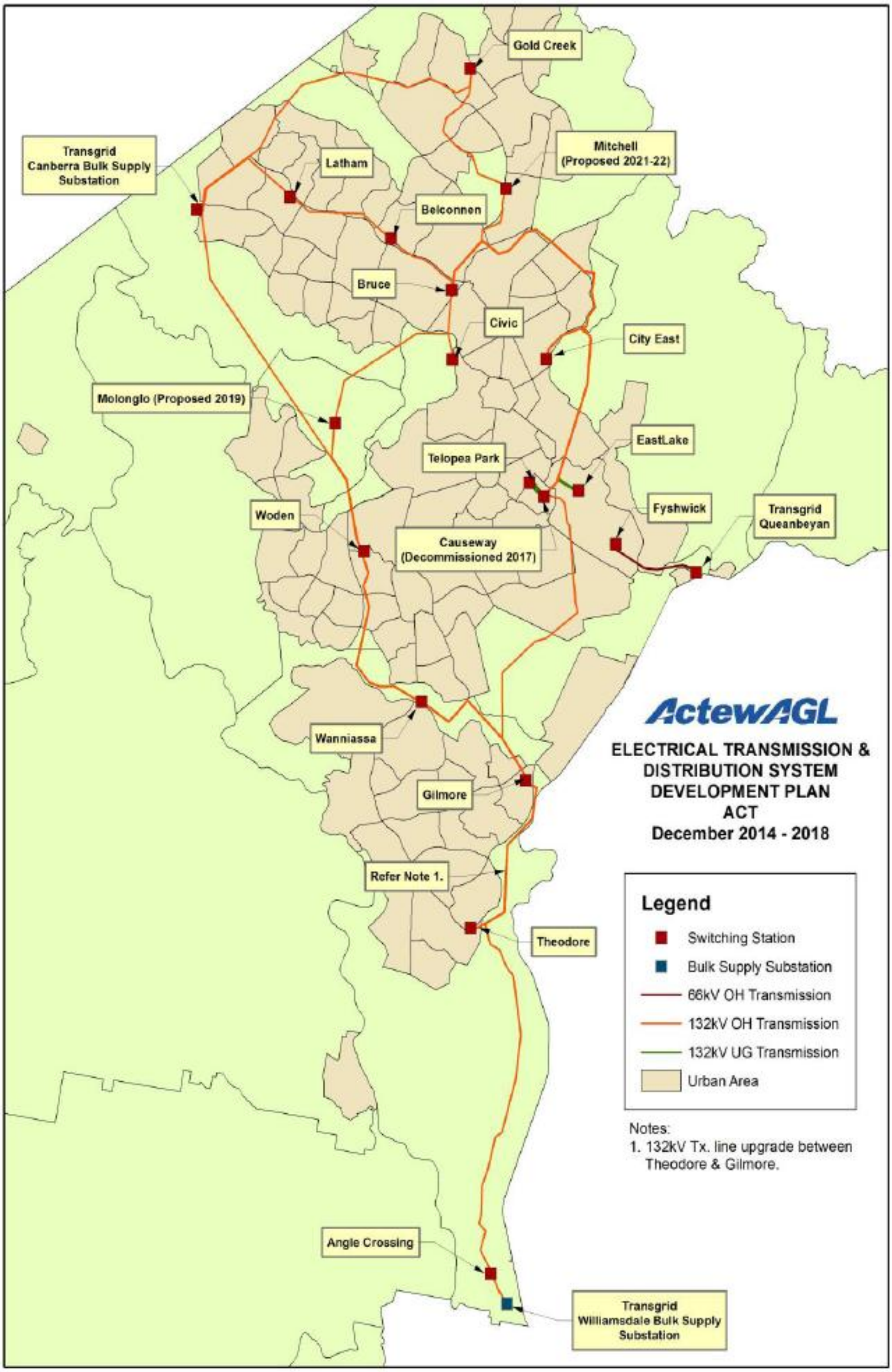
1.2.3 Dual Function Assets

ActewAGL is registered as a Distribution Network Service Provider by the Australian Energy Market Operator (AEMO) and since August 2012 as a Transmission Network Service Provider.

NER Rule 6.24.2 provides that any part of a network owned, operated or controlled by a Distribution Network Service Provider which operates between 66kV and 220kV, and which operates in parallel with and provides support to the higher voltage transmission network is deemed to be a dual function asset. Part of ActewAGL's network meets the requirements of part (a) of the NER definition for transmission assets. As these network assets are owned, operated and controlled by a Distribution Network Service provider they are regarded as *dual-function assets* for the purposes of Chapters 6 and 6A of the Rules.

Under the NER, a DNSP having dual function assets is allowed to incorporate their Transmission Annual Planning Report (TAPR) obligations within their Distribution Annual Planning Report (DAPR). This is the approach taken in this document.

Figure 1: ACT Electrical Transmission System



1.3 Methodologies & Assumptions

This document represents a status report as at December 2013 to our customers and stakeholders on the needs, options and proposed augmentations and asset replacements to ActewAGL's distribution network over the next ten year period. The system limitations and constraints have been identified using ActewAGL's distribution network augmentation criteria and the maximum demand forecasts for summer and winter.

The peak demand placed upon an electricity network is influenced by many factors, including the economy, customer activity, the type and nature of customer installations connected to the network, and the extremes of weather conditions. ActewAGL forecasts the network peak demand for summer and winter for a ten-year period to enable forward planning.

Local information and knowledge of proposed major industrial and commercial developments, predicted housing and industrial lot releases, and existing and proposed embedded generation is critical for the preparation of realistic demand forecasts.

2 Distribution Network Forward Planning

ActewAGL's forward planning period is a rolling five years as a minimum. The framework used by ActewAGL for distribution network planning is shown in Appendix A – Framework for Distribution Network Planning and Expansion.

2.1 Planning Standards and Procedures

2.1.1 Planning Philosophy and Policy

ActewAGL regularly reviews its planning philosophy to ensure network performance is maintained at an appropriate level as demanded by customers and regulators.

ActewAGL applies a redundancy based deterministic planning approach to make decisions for network development and expansion. This approach takes into account the combination of demand forecasts, asset ratings and asset failure rates to identify the severity of the constraints and the timing of the solutions.

The design planning criteria and supply security standard applicable to ActewAGL are set out in Tables 2 and 3 below.

Table 2: Network Supply Security Standard

Network Element	Security Standard	Customer Interruption Time
Transmission Lines	N-1	Nil
Zone Substations	N-1	<1 minute
Distribution Subs – Commercial	N	Best practice repair time
Distribution Subs – Urban Residential	N- 1 or N	Best practice repair time
Distribution Subs – Rural Residential	N	Best practice repair time

Note: N-1 standard requires that the power transfer capability of the asset group (transmission line, substation) be maintained with the removal from service of a single element from the group.

Table 3: HV Feeder Security Standard

Feeder configuration	Firm rating as percentage of thermal capacity
Two or more feeder ties	75%
One feeder tie	50%
Feeders operating in parallel	{(n-1)/n}% *
Partial feeder tie	100% or less †
No feeder tie	100%

HV feeder performance is monitored and evaluated as part of ActewAGL's network management and planning process and to ensure that the network reliability targets set out in the technical regulator's Electricity Distribution (Supply Standards) Code 2013 are met. Poorly performing feeders undergo detailed analysis to develop solutions to address performance issues. Capital expenditure has been allocated for implementing these solutions in this planning period – see Table 6

2.1.2 Planning Process

The distribution network planning and expansion framework in Appendix A – Framework for Distribution Network Planning and Expansion details the planning process, objectives and drivers. The process commences with a comprehensive analysis of indicators and trends to forecast the future demands on the network. This includes economic activity forecasts, local growth patterns, demand management, regulatory and customer expectations.

ActewAGL has an ongoing focus on consumer engagement for our planning processes where we strive to actively engage with our consumers in the forward planning of our electrical system.

ActewAGL has set priorities for distribution project planning and consumer engagement which include:

- Preparing consultation plans on proposed significant projects under the Regulatory Investment Test RIT (D)) process.
- Identifying credible non-network options through our demand side engagement strategy with our customers and non-network providers.
- Engaging with relevant 'end user' or consumer cohorts, consumer representative groups, retailers and industry bodies.

A detailed analysis of the network is then carried out to identify performance and capability shortcomings. All viable augmentation and operational options are considered, balancing performance risk against costs to identify optimal solutions to meet forecast requirements.

2.2 Asset Management Strategy

The Asset Management Strategy is intended to define the strategic objectives and approach to the management of the relevant physical assets within the organisation, in a manner which:

* "n" represents the number of feeders operating in parallel.

† A partial feeder tie refers to a tie with limited back feeding capacity. The firm capacity of a feeder with a partial feeder tie may be set below 100% its thermal capacity.

- Is optimised and sustainable in terms of whole-life, whole-system cost over the long-term;
- Assists in the delivery of the organisation's overall vision, organisational strategic plan and objectives;
- Appropriately considers how the organisation will supply current and future demand via the management of the condition and performance of the asset base;
- Appropriately considers the necessary current and future Asset Management capabilities of the organisation, in terms of people, processes, systems, equipment and data to achieve the identified outputs and objectives.

The asset management strategy is derived from and is consistent with the overall ActewAGL Distribution Asset Management Policy, which in turn is consistent with and contributes to the achievement of the following initiative of the ActewAGL Distribution Strategy: "develop a Strategic Asset Management Plan that is based on the PAS 55 methodology and more closely aligned with a risk based Reliability Centred Maintenance (RCM) approach."

The asset management strategy has been developed based on good practice guidance from internationally recognised sources, including the Global Forum on Maintenance and Asset Management (GFMAM) and the Institute of Asset Management (IAM). It has been developed to comply with the relevant clauses of BSI PAS 55:2008 (specifically clause 4.3) and the emerging requirements of the ISO55000 series of standards.

2.3 Forecasts for Forward Planning

The load demand forecasting is critical because it is one of the main drivers for capital expenditure. Within the planning drivers, the network load demand forecasting is possibly the most complex because of its probabilistic and unpredictable nature. It is unpredictable due to its dependence on a number of factors such as ambient temperatures, weather patterns, and in particular, load growth patterns.

A ten- year forecast of maximum summer and winter load demands at all zone substations is developed. Load growth varies from year to year and is not uniform across the whole network. It is not unusual to find parts of the network that grow at three or four times the average network growth rate, while other parts of the network experience no growth at all.

2.4 Forecasting Methodologies

ActewAGL's zone forecasts use linear regression to model the historical trend of demand growth, and to forecast future peak demand. Two separate forecast scenarios are produced, for summer and winter peak demands. This is because peak demands usually occur in summer and winter, where there are severe weather conditions. Also, summer and winter are observed to have different drivers/patterns of demand.

The steps in developing the zone forecasts include:

1) Collecting historical data – peak demand data from internal databases, as well as historical data for temperature variables from the Bureau of Meteorology.
2) Adjusting for load transfers/switching – ActewAGL currently has limited data on load transfers/switching. Nevertheless, effects of load transfers/switching are approximated and accounted for when deemed material, e.g. abnormal historical maximum demands caused by temporary switching are eliminated, and permanent load transfers are factored into the models.
3) Developing the forecast model (Model selection) – 3 daily peak demand points from each year's summer/winter are extracted for the last 10 years for each of the zones. Historical data for potential explanatory variables corresponding to the peak demand days are also obtained. Subsequently, using the peak demand as the dependent variable, various possible regression models are fitted. The model that fits the data "best" based on stepwise regression and other statistical criteria is then selected to be the final model used in subsequent forecasting.
4) Obtaining 10% and 50% PoE weather condition data – analyse the temperature data since 1990, and pick out the 90^{th} and 50^{th} percentile to allow the model to produce the forecast demand given 1 in 10 year and 1 in 2 year weather conditions.
5) Model validation – scrutinize statistical model diagnostics and conduct goodness of fit analysis.
6) Factoring in possible future block loads to develop the final forecast – adjust the initial forecast for expected future block loads. Note that only the effects of block loads above the forecast trend will be added to the overall forecast, to minimize the overestimation effect brought about by it being impossible to isolate the effect of historical block customer loads from the historical trend. The final forecast includes 10% and 50% PoE forecasts, which correspond to the 1 in 10 year and 1 in 2 year weather conditions, and a 90% prediction interval for each of these forecasts.

Modelling/Forecasting Notes

1) The 10% and 50% PoE demand forecasts are based on the 90^{th} percentile and median weather variables respectively. In winter, the difference between the 90^{th} percentile and the median weather variables is very small, and as such there is a very small difference between the two forecasts.
2) Data on block loads are only available and accounted for in the forecasts for approximately the next 18 months. Longer term projects/developments are not accounted for in the forecasts. This could lead to an underestimation of peak demand in the longer term.
3) The forecasts are based on the historical/current state of the network, i.e. they do not factor in unrealised planned work. For example, the Fyshwick Zone forecast does not account for possible future transfers to East Lake Zone, which could reduce the Fyshwick peak demand.

2.4.1 Forecasting Principles

The best-practice modelling/forecasting principles that ActewAGL adheres to are described in the table below.

Table 4 – Forecasting Principles

Principle	Description
Data	Obtain reliable and unbiased data from reputable sources, conduct data checks to remove/repair erroneous data and manage data effectively.
Model calibration	Use appropriate statistical estimation methods.
Parsimony	Use only as many parameters as necessary to fit the model, to minimise unnecessary complexity and allow model to be easily replicable.
Fit to theory	Choose models which are supported by relevant theory.
Fit to evidence	Show that the model adequately accounts for history used in calibration (conduct back-testing).
Logical model	Explanatory variables in the model should have theoretical basis, and have theoretically correct signs.
Model validation	Analyse the statistical significance of variables, goodness of fit, diagnostic checking of residuals etc.
Model documentation	Detailed and thorough documentation of modelling process to ensure transparency and repeatability.
Version source control	Track changes made to models.

2.5 Load Forecasts

The information as shown on Tables 5 and 6 below, gives the ten-year forecast of maximum summer and winter load demands at each bulk supply point and at each of ActewAGL's zone substations.

Table 5: Forecasts for Zone Substations (50% PoE)

		Zone Substation Rating, MVA																					
Zone Substation		Belconnen		City East		Civic		Fyshwick		Gilmore		Gold Creek		Latham		Telopea Park		Theodore		Wanniassa		Woden	
Season		S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W
Rating	Continuous	55	55	95	112	110	110	28	28	45	45	57	57	95	100	100	100	45	45	95	100	95	100
	Emergency	63	76	95	114	114	143	28	28	62	69	76	76	95	114	114	114	62	69	95	114	95	114
		Zone Substation 50%PoE Load Forecast, MVA																					
Year		S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W
2014		59.5	56.8	78.7	70.5	60.4	56.0	40.5	34.2	22.2	26.8	49.2	55.6	54.5	70.8	107.8	102.4	29.8	30.4	73.4	80.2	81.7	79.9
2015		61.8	59.1	78.0	70.1	60.5	56.1	41.9	35.1	22.9	27.7	52.3	58.7	55.2	71.0	109.8	103.5	30.6	30.4	74.0	79.3	82.0	79.2
2016		61.8	59.1	77.2	69.7	60.5	56.1	43.3	36.0	23.6	28.6	55.4	61.8	55.9	71.0	110.9	104.7	31.4	30.4	74.6	78.3	82.0	78.2
2017		61.8	59.1	76.3	69.3	60.5	56.1	44.6	36.9	24.3	29.4	58.4	64.9	56.6	71.0	112.0	105.8	32.2	30.4	75.2	77.3	82.0	77.2
2018		61.8	59.1	75.5	68.9	60.5	56.1	46.0	37.8	25.0	30.3	61.5	68.0	57.3	71.0	113.1	106.9	33.0	30.4	75.8	76.3	82.0	76.3
2019		61.8	59.1	74.7	68.5	60.5	56.1	47.4	38.8	25.7	31.2	64.6	71.1	58.0	71.0	114.2	108.1	33.9	30.4	76.4	75.3	82.0	75.3
2020		61.8	59.1	73.9	68.1	60.5	56.1	48.7	39.7	26.4	32.1	67.7	74.2	58.7	71.0	115.3	109.2	34.7	30.4	77.0	74.3	82.0	74.3
2021		61.8	59.1	73.1	67.7	60.5	56.1	50.1	40.6	27.1	33.0	70.8	77.4	59.4	71.0	116.4	110.4	35.5	30.4	77.6	73.3	82.0	73.4
2022		61.8	59.1	72.3	67.3	60.5	56.1	51.5	41.5	27.8	33.8	73.8	80.5	60.1	71.0	117.5	111.5	36.3	30.4	78.2	72.3	82.0	72.4
2023		61.8	59.1	71.5	66.9	60.5	56.1	52.8	42.4	28.5	34.7	76.9	83.6	60.8	71.0	118.6	112.6	37.1	30.4	78.8	71.3	82.0	71.4

Note: The forecasts are based on the historical/current state of the network, i.e. they do not factor in unrealised planned work. For example, the Fyshwick Zone forecast does not account for possible future transfers to East Lake Zone, which could reduce the Fyshwick peak demand. At the time the forecast was developed there was no load connected to East Lake Zone.

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Table 6: Forecasts for Zone Substations (10% PoE)

		Zone Substation Rating, MVA																					
Zone Substation		Belconnen		City East		Civic		Fyshwick		Gilmore		Gold Creek		Latham		Telopea Park		Theodore		Wanniassa		Woden	
Season		S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W
Rating	Continuous	55	55	95	112	110	110	28	28	45	45	57	57	95	100	100	100	45	45	95	100	95	100
	Emergency	63	76	95	114	114	143	28	28	62	69	76	76	95	114	114	114	62	69	95	114	95	114
		Zone Substation 10%PoE Load Forecast, MVA																					
Year		S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W
2014		63.7	57.2	84.1	70.8	62.7	56.5	42.7	34.6	23.1	26.8	52.2	55.7	58.5	71.2	113.1	103.1	31.0	30.6	79.1	80.6	85.4	80.8
2015		66.0	59.5	83.4	70.5	62.7	56.6	44.1	35.5	23.8	27.7	55.3	58.9	59.2	71.4	115.2	104.2	31.8	30.6	79.7	79.6	85.7	80.2
2016		66.0	59.5	82.6	70.1	62.7	56.6	45.4	36.4	24.5	28.6	58.4	62.0	59.9	71.4	116.2	105.4	32.6	30.6	80.3	78.6	85.7	79.2
2017		66.0	59.5	81.7	69.7	62.7	56.6	46.8	37.3	25.2	29.4	61.5	65.1	60.6	71.4	117.3	106.5	33.4	30.6	80.9	77.6	85.7	78.2
2018		66.0	59.5	80.9	69.3	62.7	56.6	48.2	38.2	25.9	30.3	64.6	68.2	61.3	71.4	118.4	107.7	34.3	30.6	81.5	76.6	85.7	77.3
2019		66.0	59.5	80.1	68.9	62.7	56.6	49.6	39.1	26.6	31.2	67.7	71.3	62.0	71.4	119.5	108.8	35.1	30.6	82.1	75.6	85.7	76.3
2020		66.0	59.5	79.3	68.5	62.7	56.6	50.9	40.0	27.3	32.1	70.7	74.4	62.7	71.4	120.6	109.9	35.9	30.6	82.7	74.6	85.7	75.3
2021		66.0	59.5	78.5	68.1	62.7	56.6	52.3	40.9	28.0	33.0	73.8	77.5	63.4	71.4	121.7	111.1	36.7	30.6	83.3	73.7	85.7	74.3
2022		66.0	59.5	77.7	67.7	62.7	56.6	53.7	41.8	28.7	33.8	76.9	80.6	64.1	71.4	122.8	112.2	37.5	30.6	83.9	72.7	85.7	73.4
2023		66.0	59.5	76.9	67.3	62.7	56.6	55.0	42.7	29.4	34.7	80.0	83.7	64.8	71.4	123.9	113.4	38.4	30.6	84.5	71.7	85.7	72.4

Notes:

a. Fyshwick main transformer 2 hour emergency rating has been downgraded to 28MVA in August 2013. When the cause for this down rating is rectified the original 2 hour emergency rating will be reinstated and the deficit of capacity and demand will reduce to 6MVA from 28MVA.

b. Residential demand growth in Molonglo valley has not been accounted for load forecasting of zone substations (Woden and Civic). A new zone substation (Molonglo) was proposed to take this demand due to the high rate of land releases predicted in 2011/12 and the foreseen supply quality issues associated with significant demand increases when supplied from Woden and Civic zone substations.

c. S = Summer; W = Winter. Summer refers to the months of December, January and February. Therefore December 2012 would be shown as summer 2013.

d. The forecasts are based on the historical/current state of the network, i.e. they do not factor in unrealised planned work. For example, the Fyshwick Zone forecast does not account for possible future transfers to East Lake Zone, which could reduce the Fyshwick peak demand. At the time the forecast was developed there was no load connected to East Lake Zone.

2.6 Forecasts for Future Assets

Future assets have been identified through the planning process for the forward planning period. Load forecasts and new major customer connection requests have been the input for the maximum demand forecasting. Table 7 below shows the future assets and the timing of their completion. The details of these projects including the system constraints expected to be relieved are discussed in Chapter 3 & 4.

Table 7: Future ActewAGL Network Assets in excess of $2M for Forward Planning Period

Asset Type	Description	Timing of Completion	Cost
TransGrid – ActewAGL Connection Points	Nil	NA	
Transmission Lines	Upgrade of existing 132kV Williamsdale – Theodore Transmission line section to match transfer capability of the rest of the transmission network	2018	$9.65M
	132kV line relocation – East Lake Zone Substation Stage 2 : part of Eastlake Zone works	2017	$6.59M
Zone Substations	Fyshwick Zone substation Transformer CT upgrade to optimise substation rating	2014	
	Installation of Belconnen Zone Substation Transformer No.3 to increase substation rating	2018	$12.72M
	New Molonglo Zone Substation	2019	$41.37
	East Lake Zone substation second transformer	2018	$3.0M
HV 11kV Feeders	New 11kV feeder for commercial customer from Gold Creek Zone Substation	2015	$3.19M
	New 11kV feeder to Belconnen Trade Service Area from Latham Zone Substation	2019	$2.1M
	New 11kV feeder for Tuggeranong Town centre from Wanniassa Zone Substation	2018	$2.69
	New 11kV feeders and inter-zone feeder ties from East Lake Zone Substation Stage 2	2016	$2.0M
	New 11kV feeders and inter-zone feeder ties from East Lake Zone Substation Stage 3	2018	$2.0M

The assets in Table 7 are the likely solutions to address anticipated network constraints and performance issues. ActewAGL will consult with non-network providers and customers to take advantage of any emerging non-network options before committing to the final solutions to address these issues.

2.7 Material Effects on the Network

For this report 'material impact' is greater than $2M.

2.7.1.1 Fault Levels

Increase in fault levels are not expected to cause a material impact on the network over the next 5 years. The commissioning of three large scale solar farms will lead to a slight increase in the fault levels at the connection points. The FRV solar farm (20MW) is planned for commissioning in May 2014 and will inject directly into the 11kV busbar at the Theodore 132/11kV zone substation. The

Zhenfa (13MW) and Elementus (7-10MW) solar farms are planned for commissioning in December 2014 although connection points are still to be finalised. Network technical studies carried out for the FRV solar farm show that the total fault level including contribution from this facility is within the withstand capability of the network. It is reasonably expected that the other facilities will reflect the same outcome.

2.7.1.2 Voltage Levels

The 'ACT Electricity Distribution Supply Standards Code 2013' updated in August 2013 now requires compliance with AS 60038 Standard Voltages. ActewAGL is accordingly modifying its Service and Installation Rules to reflect the new voltage standard. The expected financial and technical impacts of the amendment to the standards code are yet to be fully determined.

2.7.1.3 Power System Security Requirements

The commissioning of the Williamsdale 330/132kV station in February 2013 introduced a second bulk supply point into the ACT to address power system security requirements. The Williamsdale 330/132kV station is linked to the ACT system at Theodore and Gilmore 132kV zone substations by two new 132kV lines. A second stage of upgrading the existing Theodore to Gilmore 132kV circuits is planned for 2018. This project is a necessary component of the second supply point project, which was initiated by the ACT Government regulation, Utilities Act 2000, section 22, Utilities Exemption 2006 (No. 1).

2.7.1.4 Quality of Supply

It is anticipated that there will be quality of supply issues requiring capital expenditure during the next 10 year period. These are typically initiated in response to customer complaints and feedback or from routine network performance audits.

The ACT Government passed the Climate Change and Greenhouse Gas Reduction (Renewable Energy Targets) Determination 2013 (No 1) in October 2013 which sets a target of 90% use of renewable energy (electricity) by 2020. The impact of power taken from renewable energy sources on supply quality in ActewAGL's distribution network is still to be determined.

2.7.1.5 Ageing and Potentially Unreliable Assets

There are several programs in the asset management plan for the forward planning period that in total will have a material impact on the distribution network. ActewAGL has adopted a Reliability Centred Maintenance (RCM) program for asset management. The projects to manage the condition and performance of network assets to assure optimal delivery of present and forecast demand requirements as defined in ActewAGL's asset management strategy (see Section 2.2) include:

- replacing poles;
- replacing distribution substations;
- replacing/refurbishing zone substation assets;
- replacing underground cables.

3 Transmission Network Constraints and Proposed Network Development

This chapter describes present and emerging constraints on the transmission network including TransGrid connection points and the proposed solutions to relieve these constraints. These constraints are expected to emerge within the rolling ten-year forward planning period.

3.1 Transmission Network

3.1.1 TransGrid-ActewAGL Connection Points

ActewAGL's transmission network is connected to the TransGrid transmission network at three connection points as outlined in section 1.2.2 in Chapter 1.

These connection points are:

1. Canberra 330kV bulk supply substation
2. Williamsdale 330kV bulk supply substation
3. Queanbeyan 132kV bulk supply substation

The Canberra and Williamsdale 330kV bulk supply substations are the main connection points. Queanbeyan 132kV connection point supplies Fyshwick commercial and industrial areas via Fyshwick zone substation. These connections points are shown in the system diagram in Figure 1: ACT Electrical Transmission System

3.1.2 Transmission Lines

ActewAGL's 132kV transmission network is a robust mesh network. ActewAGL's 66kV transmission network is made up of two radial feeders. The thermal ratings of these transmission lines are provided in Appendix C – Transmission Line Ratings.

The peak demand on ActewAGL's transmission network over 2013 summer was 583MVA on 18th January 2013. The forecast peak demand based on 10% PoE for the next ten years is within the thermal rating of the transmission lines in response to a single contingency event on the network.

3.2 Transmission Network Constraints

ActewAGL has implemented a project to develop the southern portion of its transmission system to meet a directive issued in 2006 by the ACT Government to establish a southern supply to the ACT. Therefore in the event of the total loss of Canberra 330/132kV bulk supply substation, the ACT will be supplied from the Williamsdale 330/132kV bulk supply substation. A transmission line constraint has been identified on the transmission line section between Theodore and Gilmore zone substations should the ACT need to be supplied from Williamsdale 330kV bulk supply substation. This is discussed in more detail below.

3.2.1 Southern Supply to the ACT

Stage 1 of this project which has been jointly planned with TransGrid involves:

1. Construction by TransGrid of the Williamsdale 330/132kV bulk supply substation and conversion of the double circuit 132kV line to a 330kV transmission line between Canberra and Williamsdale bulk supply substations.
2. Construction by ActewAGL of a 132kV twin circuit line from the Williamsdale 330/132kV bulk supply substation to connect to one of the existing ActewAGL 132kV single circuits between Theodore and Gilmore zone substations.

The existing Theodore to Gilmore lines has an identified load flow constraint that will prevent supplying the total ACT demand from the Williamsdale bulk supply substation in the event of an outage at the Canberra bulk supply substation. To address this ActewAGL has scheduled as a second stage of the project an upgrade of the existing 132kV line sections between Theodore and Gilmore zone substations. This project is planned for completion in 2018.

in the interim period before the completion of Stage 2 in the event of a loss of Canberra 330kV bulk supply substation a temporary emergency response supply arrangement has been made with Transgrid which has constructed assets at its Yass and Canberra substations to meet this eventuality.

Further details are contained in the TransGrid 2013 Transmission Annual Planning Report. In a further stage to complete the second supply point arrangements into the ACT TransGrid has committed to developing a 330kV supply circuit directly to its Williamsdale 330kV bulk supply substation from a new 330kV switching station at Wallaroo, effectively bypassing its Canberra 330kV bulk supply substation.

3.3 Proposed Transmission Network Development

The following work is planned for the forward planning period as part of East Lake zone substation development:

- Decommissioning of the Causeway switching station by 2017.
- Removal of the existing 132kV overhead line section from East Lake zone substation to Causeway switching station
- Construction of a new underground cable section from Eastlake zone substation for connection to the existing City East 132 kV line (to replace the overhead section removed above)
- Removal of a section of the existing 132KV overhead line from Gilmore to Causeway switching station
- Construction of a new underground cable section from Eastlake zone substation for connection to the existing Gilmore 132 kV line (to replace the overhead section removed above)
- Extension of the existing 132KV UG cables between Telopea Park and Causeway to East Lake Zone substation.
- Installation of the 2nd power transformer in Eastlake zone substation

4 Distribution Network Constraints and Proposed Development

This chapter describes present and emerging network constraints in the HV distribution network including zone substations and HV feeders and proposed solutions to relieve these constraints. These constraints are expected to emerge within the rolling five-year forward planning period.

4.1 Zone Substations

ActewAGL has eleven 132/11kV zone substations, one mobile zone substation, one 66/11kV zone substation and two 132kV switching stations. **Error! Reference source not found.** provides a current ist of the zone substations. Because ActewAGL has dual function assets then all 132/11kV zone substations are classified as transmission assets, except Fyshwick, Telopea Park and Angle Crossing which are classified as distribution.

Stage 1 of the East Lake zone substation project completed in late 2013, will provide additional supply capacity required to meet increasing demand from the South Canberra region.

The ten year load forecast based on 10% PoE indicates that some zone substations will exceed their 2 hour emergency rating during this period. These events have been identified as constraints that will prevent these zone substations from meeting the supply security standard described in Table2. Details of constraints associated with equipment rating are shown in Table 7 below.

New feeders are required from Gold Creek zone susbstation to supply residential and commercial load in the Mitchell area. The 11 kV switchboards in the zone substation will be extended to accommodate this.

A new major urban development at Molonglo and North Weston districts with a total planned population of 55,000 over the next 20 years is expected to introduce an additional demand of around 15MVA by 2020. .It has been assessed that the early stages of this development, until 2016, can be supplied from Woden and Civic zones by upgrading and extending selected feeders allowing construction of the Molonglo zone substation to be deferred.

Table 7: Zone substation constraints

Zone Substation	MVA			
	Summer		Winter	
	2h Emergency Rating	Forecast Load	2h Emergency Rating	Forecast Load
Fyshwick	28	**43**	28	**35**
Telopea Park	114	**120**	114	110
Belconnen	63	**66**	76	60

4.1.1 Impact of Zone Substation Constraints

The impacts on the distribution network as a result of the existing and emerging constraints at zone substations are shown in Table 8 below.

Table 8 Impacts of Zone Substations Constraints

Demand in excess of rated capacity		System Impact	Estimated Time and Duration of Impact
Zone substation	MVA		
Fyshwick	15	Supply security and reliability	January 2014, continuous
Telopea Park	6	Supply security and reliability	January 2014, continuous
Belconnen	3	Supply security and reliability	January 2014, continuous

4.1.2 Potential Solutions to address Zone Substation Constraints

Potential solutions have been identified to address the existing and emerging constraints at zone substations. Load transfer between zone substations through 11kV feeders is considered to be the most preferred and effective solution.

Table 9 shows potential network and non-network solutions identified to address the constraints on zone substations.

Table 9 Zone substation Constraints and Possible Solutions

Demand in excess of rated capacity		Potential Solutions (MVA)			Potential Solutions Total (MVA)
Zone substation	MVA	Equipment Upgrade	Load Transfer	Demand Management[1]	
Fyshwick	15	22	11	2	35
Telopea	6	0	11	0	11
Belconnen	3	32	5	2[2]	39

[1] Nominal MVA values are shown. These will be confirmed once specific DSM studies currently in progress are completed.

[2] Demand management projects at Belconnen Westfield are expected to deliver around 4.5MVA demand reduction on Belconnen Zone

Analysis of Potential Solutions for Zone Substations Constraints

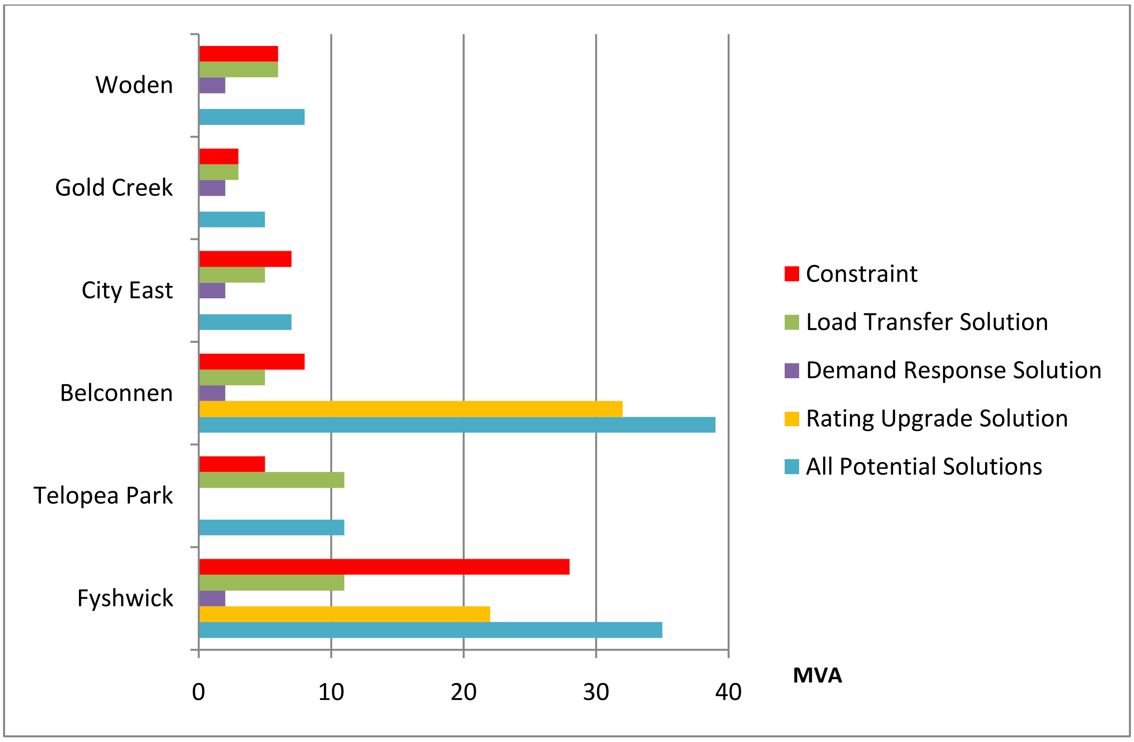
Load transfer between zone substations is the preferred solution to decrease the impact of zone substation constraints and to defer investments associated with other solutions. This option was investigated and the results are shown in Table 10 .

Table 10–Inter zone substation load transfer scenario

Demand in excess of rated capacity		Load available for transfer		Estimated Time for load transfer (Month/Year)
Zone substation	MVA	MVA	Transfer to Zone substation	
Fyshwick	15	11	Eastlake	January 2014
Telopea Park	6	11	Eastlake	January 2014
Belconnen	3	5	Civic and Latham	January 2014
City East	7	5	Civic	January 2014
Gold Creek	3	3	Belconnen	January 2015
Woden	6	6	Civic	January 2015

The chart in Figure 2 plots the contribution from the various solutions to address zone substation constraints.

Figure 2– Breakdown of Solutions to Address Zone Substation Constraints



Actual demand may drop below forecast demand during the forward planning period due to variation in conditions that form the basis of the initial forecast (such as weather, economic activities and customer's project timing). The implication of this is that non-augmentation solutions may be adequate to manage the constraints on all zone substations apart from Fyshwick.

4.2 High Voltage Feeders

ActewAGL has 239 11kV feeders and two 22kV feeders fed from 12 zone substations within the ACT. The ten-year load forecast based on 10% PoE indicates that several HV feeders will exceed their firm or thermal ratings within the next 2 years and fail to comply with ActewAGL's HV feeder security standard set out in Table 2. These feeders predominantly service areas that have known greenfield and new commercial development. Appendix D – HV Feeder Constraints is a complete listing of these feeders.

ActewAGL believes there is opportunity to manage the majority of feeder security non-compliance instances, particularly those that have not exceeded their thermal rating, using a non-augmentation approach. This will be facilitated by a project that is currently in place to implement Schneider Electric's Distribution Management System (DMS) for the distribution network. The DMS, once completed in mid-June 2015, will provide monitoring, analysis, control and planning tools to manage ActewAGL's distribution network. This suite of tools will be used to optimise existing network assets without resorting to costly augmentation work. Some of the tools available from the Schneider DMS for feeder management are:

- Real Time Load Flow and State Estimation: to obtain actual or realistic operating conditions and constraints on the feeders based on actual loading and network configuration
- Network Reconfiguration: Suggests optimal network configuration to meet specific criteria such as minimisation of power losses, feeder load imbalance, maximisation of reliability statistics and removing overloads on overloaded sections.
- Near and Short Term Load Forecast: Predicts network loading at feeder level in the next few hours to next few days based on defined load profile linked to temperature correlations and forecast weather conditions.

Feeders that have already exceeded their firm rating and are expected to reach or exceed their thermal limits in the next 2 years are of immediate concern as they pose unacceptable risk to supply security. These feeders have been selected for remedial action using the options discussed in the following section.

4.2.1 Potential solutions for HV feeder constraints – feeders that will exceed their thermal rating in the next 2 years

Load transfer between adjacent 11kV feeders is the preferred solution. However load transfer is not feasible if the size of load to be transferred exceeds the combined available capacity of the target feeders. This is particularly the case if the load involved is a single large amount with a flat demand profile (e.g. Data Centre load).

Several demand management projects have been identified for possible implementation. The primary purpose of these projects is to address constraints at zone substation level. This will also assist feeder demand management. ActewAGL is also participating in the AER's Demand Management Incentive Scheme (DMIS) and considers that the experience it has gained from participating in this scheme during the 2009-2014 regulatory period will enable ActewAGL to develop cost effective and sustainable solutions to manage network demand in the forward planning period.

Table 11: Schedule of options to address 11kV feeder thermal loading constraints

Feeder Name		Zone Substation	Solutions to address feeder constraint	
			Load Transfer (Note 1)	Demand Management - Demand Response, On-site Generation (Note 2)
			MVA deployed	MVA deployed
1	Wattle	Civic	2	1
2	Whyalla	Fyshwick	2	
3	Fincham	Wanniassa	1.5	0.5
4	Benjamin	Belconnen		1.4
5	Fielder	Latham		1.7
6	Riverside	Telopea Park	4	0.6

Notes:

1 Inter feeder load transfer with minor augmentation work (establishment of feeder ties where required)

2 Demand management projects at Belconnen Westfield could to deliver around 4.5MVA demand reduction on Belconnen and Civic Zone feeders

5 Summary of Regulatory Investment Test Projects

This chapter describes the status of Regulatory Investment Tests that are currently in progress or were completed last year for augmentation projects with a total project cost in excess of $5million.

From 1 January 2014 the Regulatory Investment Test will be replaced by the Regulatory Investment Test – Distribution, (RIT-D) for distribution investments. RIT-D proponents must apply the RIT-D in accordance with Clause 5.17 of the NER to assess the economic efficiency of proposed investment options. The RIT-D is an economic cost benefit test used for assessing and ranking different electricity investment options where the identified need exceeds $5 million.

5.1 Status of RIT-D Projects

There are no RIT-D projects that were completed in the preceding (2013) year or that are currently in progress.

Projects in the forward planning period that will require an RIT-D are shown in Table 12.

Table 12: Description of Augmentation Projects Subject to the Regulatory Investment Test for Distribution

Identified System Limitation	Associated Project	Estimated Cost	Start RIT-D
The existing network will not be able to meet anticipated demand from new development in the Molonglo District due to supply capacity and load transfer capability constraints.	Establishment of a new zone substation in the Molonglo District.	$24M	Nov-14
Belconnen zone substation is expected to exceed its emergency rating limit by summer 2014	Installation of a new (3rd)transformer	$12.7M	Jan -14

6 Summary of Committed Investments above $2Million to address refurbishment or replacement need

This is covered in Section 2.7.1.5

7 Joint Planning with TransGrid and Other DNSPs

7.1 Summary of the process and methodology to undertake joint planning

TransGrid and ActewAGL have set up a Joint Planning Sub-committee that meets annually.

The joint planning process covers the following points:

1. Evaluation of relevant limitations of both networks and progression of joint planning activities to address these limitations,
2. Demand and energy forecasts,
3. Non-network development proposals,
4. Long term transmission and distribution developments, and
5. Annual planning reports and presentations.

7.2 Description of investment planned through joint planning

No investment has been planned as an outcome of the joint planning process in the preceding year.

7.3 Joint Planning with other DNSPs

There are no interconnectors with other DNSP’s. Joint planning carried out with other DNSP’s on an as needs project basis.

8 Distribution Network Performance

8.1 Reliability measures and standards in applicable regulatory instruments

ActewAGL service standards obligations mainly arise from the application of the Utilities ACT 2000 (ACT) (Utilities Act). The Utilities Act requires ActewAGL to comply with all relevant industry and technical codes, any directions by the Independent Competition and Regulatory Commission (ICRC) or the Chief Planning Executive of the ACT Planning and Land Authority (ACTPLA) made under the Utilities Act. Relevant codes include the Consumer Protection code, and the Electricity Distribution (Supply Standards) Code (Supply Standards Code).

The network reliability measures and standards are adopted from the Supply Standards Code and the referred Australian Standards therein which set out parameters for electricity supply through the ActewAGL network.

The minimum supply reliability standards are detailed in Supply Standards Code, Schedule 2. Section 6.1 of the Code also specifies that ActewAGL must publish supply reliability targets annually for the following year, which include:

- CAIDI: Customer Average Interruption Duration Index. The ratio of total customer hours interrupted to total customer interruptions. Measured in minutes and indicates the average duration an affected customer is without power.
- SAIFI: System Average Interruption Frequency Index. The ratio of total customer interruptions to total customers served. This indicates the average number of interruptions an average customer experiences.
- SAIDI: System Average Interruption Duration Index. The ratio of total customer hours interrupted to total customers served. This is expressed in minutes and indicates the average duration a customer is without power.

The 2013/14 reliability targets are given in table 13 below.

Table 13: ActewAGL Reliability Targets for 2013/14

Parameter	Target	Units
Outage time (CAIDI) *	74.6	Minutes
Outage frequency (SAIFI)	1.2	Number
Outage duration (SAIDI)	91.0	Minutes

* The value of CAIDI is an average outage duration which is calculated by: CAIDI=SAIDI/SAIFI

ActewAGL has applied an internal business target of 40 minutes for unplanned SAIDI to apply as a category within the overall externally set SAIDI target of 91 minutes in the *Supply Standards Code*.

It is proposed by the AER that from 1 July 2014 a Service Target Performance Incentive Scheme (STPIS) will be introduced as part of the 2014/15-2018/19 Regulatory Determination.

8.2 Summary description of the Quality of Supply

The *Utilities Act* requires ActewAGL to comply with all relevant industry and technical codes. The main network quality of supply measures and standards are specified in the Supply Standards Code and the referred Australian Standards therein. The main quality of supply (QOS) criteria is the maintenance of the requisite Voltage standards in accordance with AS60038. Schedule 1 of the Supply Standards Code specifies voltage dip levels and frequency, as shown in Table 14 below.

Table 14: ActewAGL Standard Code Voltage Dip Criteria

Voltage Dips		
Dips down to % of nominal volts	Max number of Dips (per year per Point of Supply) - Urban	Max number of Dips (per year per Point of Supply) - Rural
<30%	2	6
30-50%	20	40
50-70%	20	40
70-80%	25	50
80-90%	200	300

The ACT Consumer Protection Code specifies a number of minimum service standards applying to electricity distributors. Failure to meet a minimum service standard may, in some instances, attract a requirement to pay a rebate. Relevant rebate performance standards cover:

- customer connection times;
- responding to complaints;
- responding to customer notification of a problem or concern;
- required notice periods for planned interruptions to utility services; and
- responding to unplanned interruptions to supply.

8.3 Summary description of the performance of the system

The historic network reliability performance for the last 2 years is detailed in Table 15 below.

Table 15: ActewAGL Reliability Performance from 2011/12 to 2012/13

Reliability Target		2011/12	2012/13
SAIDI	**Target**	91	91
Urban		81.2	90.7
Rural Short		38.3	96.3
Network total		78.4	90.9
SAIFI	**Target**	**1.2**	**1.2**
Urban		0.81	0.81
Rural Short		0.53	0.87
Network total		0.82	0.79
CAIDI	**Target**	74.6	74.6
Urban		100.2	112.1
Rural Short		72.3	110.4
Network total		96.1	115.2

8.4 Non-compliances as per 8.1 and 8.2

Over the past two years ActewAGL has met the minimum service standards for SAIDI and SAIFI however not CAIDI. As CAIDI is a mathematical relationship between SAIDI and SAIFI (CAIDI = SAIDI/SAIFI) then a disproportional performance improvement difference by SAIFI over SAIDI will make CAIDI worse.

The SAIDI and SAIFI performances are very weather dependent with exceptional storm seasons, as experienced in January 2013, will adversely impact compared to previous years.

8.5 Process to ensure compliance

ActewAGL determines SAIDI and SAIFI on a monthly basis and verifies outcomes against monthly and annual targets. The power quality process that ActewAGL undertakes is largely driven by internal analysis, customer complaints, operational system issues, load or voltage studies arising from new loads or system constraints.

8.6 Outline of Information as STPIS

The Service Target Performance Incentive Scheme (STPIS) is a component of the AER 2014/15-18/19 Regulatory Pricing determination that will make the annual level of network tariffs dependent on service outcomes. It will commence operation in the ACT on 1 July 2014.

The ActewAGL scheme will have two components:

- reliability of supply, and
- customer service.

8.6.1 Reliability of supply

The reliability of supply component of the scheme will apply financial rewards and penalties in aggregate for each regulatory year within the regulatory control period to ActewAGL on the basis of performance relative to targets for the following parameters:

- unplanned System Average Interruption Duration Index (SAIDI), and
- unplanned System Average Interruption Frequency Index (SAIFI).

The parameters are separately applied to two feeder types – urban and short rural.

Performance targets in relation to these parameters are set at the start of the regulatory period to the average level observed over the past five years.

The maximum annual revenue at risk for the reliability of supply component is still to be finalised, however the AER default level is between +5% (upper limit) and –5% (lower limit).

The targets have not been finalised for the 2014/15-18/19 period and are not finalised at the publishing date of this report. They will be based on either the average performance over the past five regulatory years or Minimum Standards as set by the Utilities Act .

The definitions for the reliability of supply components are:

Unplanned SAIDI (System Average Interruption Duration Index)
The sum of the duration of each unplanned sustained customer interruption (in minutes) divided by the total number of distribution customers. Unplanned SAIDI excludes momentary interruptions (one minute or less).

Unplanned SAIFI (System Average Interruption Frequency Index)
The total number of unplanned sustained customer interruptions divided by the total number of distribution customers. Unplanned SAIFI excludes momentary interruptions (one minute or less). SAIFI is expressed per 0.01 interruptions.

Both components will exclude major event days which are defined in the Institute of Electrical and Electronics Engineers (IEEE) standard 1366-2003, IEEE Guide for Electric Power Distribution Reliability Indices (May 2004). The IEEE standard excludes natural events that are more than 2.5 standard deviations greater than the mean of the log normal distribution of five regulatory years' SAIDI data (the '2.5 beta method').

Customer Service
The customer service component of the scheme will apply financial rewards and penalties on the basis of performance relative to the telephone answering target which will be measured as the percentage of total calls to the fault line answered within 30 seconds. The performance target will be based on the average performance over the past five regulatory years (2009/10-13/14) or minimum standards and is not finalised at the publishing date of this report. The historic five year average is 74%.

The maximum annual revenue at risk for the customer service component is still to be finalised, the AER default level is between +1% (upper limit) and –1% (lower limit).

ActewAGL Distribution will be developing programs to improve unplanned SAIDI during the 2014/15-18/19 Regulatory period. Each program will be assessed for cost-effectiveness against the projected benefits.

9 Distribution Network Demand Side Management Activities

9.1 Summary of non-network options that have been considered in the past year

9.1.1 AER's Demand Management Incentive Scheme (DMIS)

ActewAGL is participating in this scheme and has selected to explore power factor correction at customer premises as a non-network response to demand management. The power factor and reactive power demand at large commercial customer premises were investigated with a view towards installing power factor correction capacitors to reduce demand at the premises. Sites assessed suitable for applying this solution have been contacted with offers of incentive funding towards the installation of power factor correction equipment. It is estimated that with the completion of this initiative overall demand on ActewAGL's 11kV network will be reduced in the order of 2 to 3 MVA.

9.2 Actions taken to promote non-network proposals in the preceding year

ActewAGL considers that reliable electricity supply to customers can be maintained by the effective use of DSM. Customers and non-network proponents who are involved with effective DSM will be able to access a revenue stream developed through the deferring of costly network solutions. This approach reduces the overall cost to maintain the network and results in lower electricity costs to all customers.

ActewAGL has launched DSM including DR programs by engaging customers and third party service providers through the implementation of a demand side engagement strategy.

9.2.1 Demand Side Engagement Strategy

ActewAGL's demand side engagement strategy aims to create a co-operative and pro-active relationship with customers and proponents of non-network solutions and involve them in ActewAGL's network planning and expansion decision making framework. ActewAGL will then encourage customers and potential non-network service providers to participate in the ActewAGL demand management activities with the objective that future network problems can be met by a full range of solutions to achieve optimal economical and technical outcomes.

ActewAGL's demand side engagement strategy objectives are:

1. Embrace DSM and provide opportunities to our customers and non-network service proponents to participate in resolving network and customer supply limitations,
2. Develop and apply a transparent DSMP for network planning and development,
3. Identify DSM options for individual & broad based demand management situations,

4. Provide proponents of non-network solutions with simple and effective mechanisms for obtaining information on network development proposals, and
5. Develop demand management tools and industry alliances to readily facilitate non-network options.

ActewAGL has developed a DSM process which describes how ActewAGL will investigate, assess, develop, implement, and report on non-network options. The DSMP process is integrated early into the overall network planning process to allow sufficient time for the development of non-network and DSM programs from conceptual to more detailed stages.

ActewAGL considers that effective engagement and consultation plays an important role in achieving the success of the demand side engagement strategy. Through engagement and consultation ActewAGL will seek to identify potential cost effective and customer driven DSM options that may defer more costly supply side investment.

To facilitate this process ActewAGL will maintain the following:

1. Register of demand side engagement
2. Register of contracted affiliates
3. Expression of Interests
4. DSM information on ActewAGL website
5. Incentive payments schemes
6. Demand side management planning process
7. Development of demand management plans for currently identified network constraints.

9.3 Plans for DM for the forward planning period

The Demand Side Management process will be fully implemented in the 2013/14 year and used in assessing options and alternative solutions to address existing and emerging network constraints. .

The following demand management plans are under investigation as possible solutions to identified network constraints:

9.3.1.1 Mitchell Commercial Load demand management.

This commercial load centre at Mitchell is experiencing strong load growth. The present feeder network and Gold Creek, City East and Bruce zone substations will not be able to supply this large load. A new zone substation is being considered at Mitchell.

A number of DM solutions are being considered. These include Solar PV, tri-generation, onsite diesel operation, chilled water storage, and temporary diesel generation. Peak demand reduction is expected to be 5MVA to 15MVA for the project with $320,000 a year deferment costs currently allowed with projects being selected on a project value basis. With a future light rail proposal also impacting the network then local generation in the commercial area could provide power to a light rail system.

Timing of the solution delivery includes evaluation and assessment of projects to be completed by July 2014 and implementation timing from 4 to 18 months.

9.3.1.2 The Australian National University's Demand Response & Load Curtailment Program

This project investigates potential demand side solutions in order to defer network feeder and bulk supply point capacity upgrades for the Australian National University Campus.

Due to recent expansion the current bulk supply point (BSP1) has reached maximum allowable capacity. A network capacity upgrade including the construction of second bulk supply point (BSP2) and two additional feeders has been identified as required to service the campus into the future. This DM plan is aimed at assessing the feasibility of demand side solutions in order to reduce the load on campus and defer network supply upgrades.

A number of DM solutions are being considered with peak demand reduction expected to be in the vicinity of 7 MVA. Evaluation and assessment of potential options is scheduled to be complete by July 2014, with implementation of the preferred solution taking approximately 2 to 12 months thereafter.

9.3.1.3 Woden Westfield Shopping Centre Demand Response Program

This project investigates potential demand side solutions in order to defer the construction of an additional zone sub-station located at Molonglo.

A potential expansion of Westfield's Woden shopping centre along with the development of the new residential suburb of Molonglo has placed increasing pressure upon the Woden Zone substation. To address this constraint an additional Molonglo zone substation has been proposed. Reducing load on the Woden Zone substation through effective DM solutions can assist in deferring the requirement for a zone substation at Molonglo.

A number of DM solutions are being considered with peak demand reduction expected to be in the vicinity of 4.5 MVA. Evaluation and assessment of potential options is scheduled to be complete by July 2014, with implementation of the preferred solution taking approximately 2 to 18 months thereafter.

9.3.1.4 Belconnen Westfield Shopping Centre Demand Response Program

This project investigates potential demand side solutions in order to relieve the demand on the Belconnen Zone substation thereby deferring capacity upgrade works.

Belconnen Westfield is close to multiple expansion sites, with the Belconnen zone substation also supplying initial Molonglo suburb expansions. Reducing load on the Belconnen zone substation can assist in defer the requirement for a zone substation at Molonglo as well as local upgrade requirements.

A number of DM solutions are being considered with peak demand reduction expected to be in the vicinity of 4.5 MVA Evaluation and assessment of potential options is scheduled to be complete by July 2014, with implementation of the preferred solution taking approximately 2 to 18 months thereafter.

9.3.1.5 Majura Business Park Demand Response program

This project investigates potential demand side solutions in order to defer upgrade of the City East zone substation.

A number of DM solutions are being considered, including operation of a currently under-utilised co-generation plant, with peak demand reduction expected to be in the vicinity of 2 MVA. Evaluation and assessment of potential options is scheduled to be completed by July 2014, with implementation of the preferred solution taking approximately 4 months thereafter.

9.4 Embedded Generation

There are currently two large scale generation units connected to ActewAGL's HV distribution feeder network. These generation units are two bio-gas generators situated at the Mugga Lane (3MW) and Belconnen (3MW) Waste Transfer Stations. These generators are not registered with AEMO.

Connection applications were received and have been accepted for the following large scale solar farms:

1. A 20MW solar farm by FRV whichis planned for completion in May 2014.(This facility will inject directly into the 11kV busbar at the Theodore 132/11kV zone substation.
2. A 13MW solar farm by Zhenfa which is planned for completion in December 2014..
3. A 7MW solar farm by Elementus which is planned for completion in December 2014..

Large scale embedded generation units connected to the ActewAGL network are required to be scheduled in accordance with AEMO as intermittent generators whereas smaller PV units are not required to be registered as all units are have either automatic or small generation exemption.

The majority of future embedded generation within the next 5 years are likely to be large scale Solar PV farms and the anticipated future total capacity is approximately 40MW.

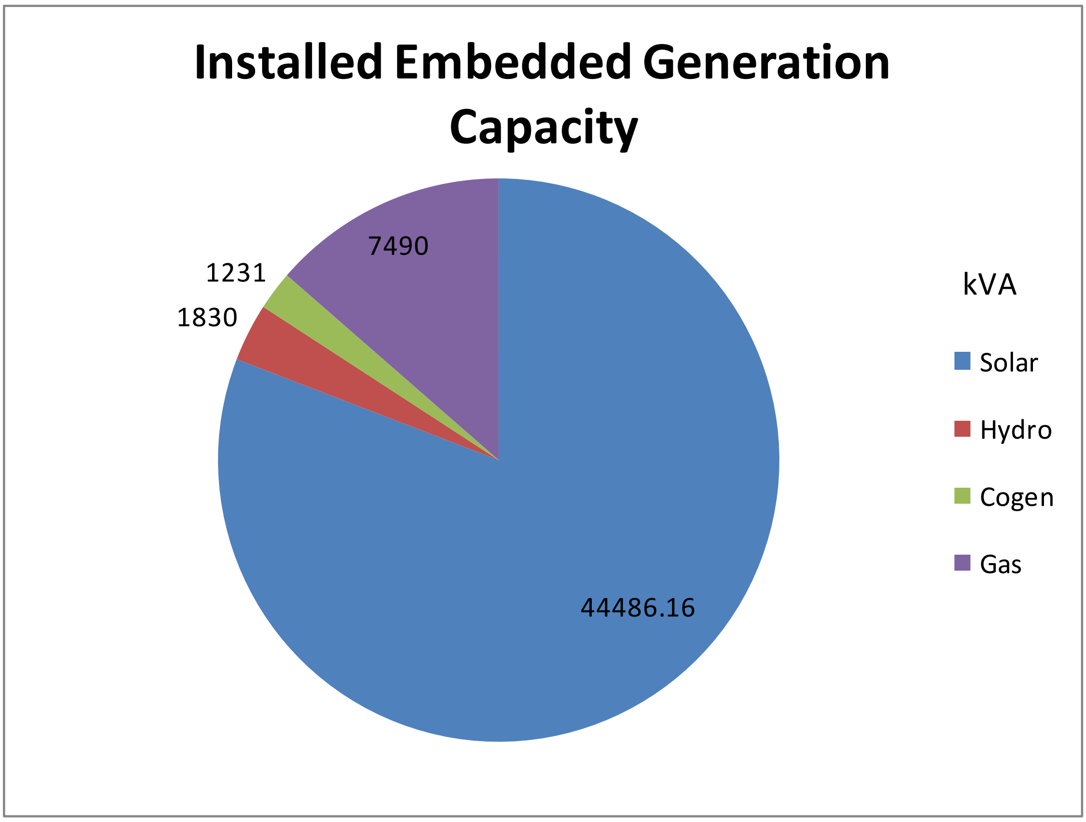
Small scale solar PV panels are installed at the domestic level to low voltage (230/400V) distribution network.

Information regarding small scale embedded generation connected to the ActewAGL network is provided in Appendix B – Embedded Generation Data. As at 1st June 2013 the total capacity of embedded generation connected to the ActewAGL distribution network was 55,037 kVA and there were 14,244 customers with embedded PV systems connected to the distribution network.

On 1st July 2013 ActewAGL moved from gross metering to net metering for all PV installations. Despite this the forecast growth in PV installation for the next 5 years is expected to remain stable at historic trend levels. The projected numbers of installations will be approximately 30,000 installations with an installed capacity of 83 MW.

The current energy mix of embedded generation into the network is shown in Figure 3 below.

Figure 3: Embedded Generation Data



10 Distribution Network Metering and Information Technology

10.1 Metering Investments

10.1.1 Metering Investments for the preceding planning year

ActewAGL introduced a policy of installing electronic metering as the standard metering installation in 2007. An annual replacement program was commenced with an average 3,600 meters replaced per annum.

Table 16: Metering expenditure in the 2012/13 year and forecast for 2013/14 year.

Meter Expenditure ($,000)	12/13	13/14
	Actual	Forecast
New Meter Installations	3,157	3,750
Meters Replacements	1,168	530
Customer contributions	105	214
Total	**4,219**	**4,066**

10.1.2 Metering Investments for the forward planning period

Install Metering Equipment (New Installations)
The installation program for customer driven work is based on historical volumes with an allowance made for customer growth. In accordance with the "*Strategic Plan- 2012: Network Metering*", all new meters installed will be electronic meters.

Replace Metering Equipment
There are two key drivers for asset replacement is:

- assets found to be non-compliant from testing regimes must be replaced to ensure compliance with NER – Chapter 7; and
- planned replacement to address specific business needs such as access, obsolete technologies, obsolete network tariffs and safety issues.

The replacement program is designed to continue to rationalise the meter fleet by removing meter types with small numbers of meters and to future-proof the meter fleet by installing electronic type meters (instead of induction disc type technology). This will allow for reduced use of time switches since the new meters can have onboard contactors for time of use type loads.

Electronic meters will also allow communications to be installed for remote sites to reduce the cost of meter reading in remote locations (in particular monthly read installations). New technology will also allow for monitoring power quality, can be capable of remote disconnect/reconnect and can allow for retail products for customers without changing the meter.

Compliance driven replacements are projected to maintain existing levels. Projected replacement volumes are shown in Table 17.

Table 17: Forward metering replacement program

Meter compliance drivers and timeframes Driver	Year	Volume
Obsolete tariffs and Compliance	2013/14	6,400
Compliance	2014/15	5,150
Compliance	2015/16	5,150
Compliance	2016/17	5,150
Total		**21,850**

10.2 IT Investments

10.2.1 IT Investments for the preceding planning period

ActewAGL has commenced two major IT replacement programs in the present planning period:

1. Core Systems Replacement Project and
2. Operational System Replacement Project.

The purpose of the Core Systems Replacement Program (CSRP) is to develop ActewAGL's technology systems and deliver operating efficiencies in the areas of Finance, HR and Distribution Billing.

The purpose of the Operational Systems Replacement Program (OSRP) is to develop an Operational Technology (OT) and Information Technology (IT) roadmap for the Distribution business that is suited to an asset intensive organisation that manages linear assets. It will be based on a geo-spatial OT environment that is tightly incorporated with the corporate IT environment and based on commercially available applications.

10.2.1.1 ArcFM/Designer

A system that provides ActewAGL with the ability to draft network designs directly in the GIS, conducive to a geospatially-centred environment. This has significant benefits for saving FTE on re-entering each design into the GIS and also provides productivity enhancements resulting in FTE savings.

10.2.1.2 Mobility Solution

A system that provides the ability to deploy works and network information directly to the field for action, removing any avoidable travel to and from the depot; improving data capture processes and overall productivity of field and office staff.

10.2.1.3 Riva Modelling

An asset management decision support tool that provides an opportunity to enhance and expand the application PAS55 practices in ActewAGL and support more informed asset investment.

10.2.1.4 Advanced Distribution Management System Disaster Recovery Facility Implementation

A system that provide a backup facility to operate the distribution network in the event of an emergency where the primary control system cannot be used.

10.2.1.5 Advanced Distribution Management System – System Enhancements

A system that provide a platform for continued improvement in network management as well as providing tools to meet ActewAGL's future needs (particularly around transmission network management).

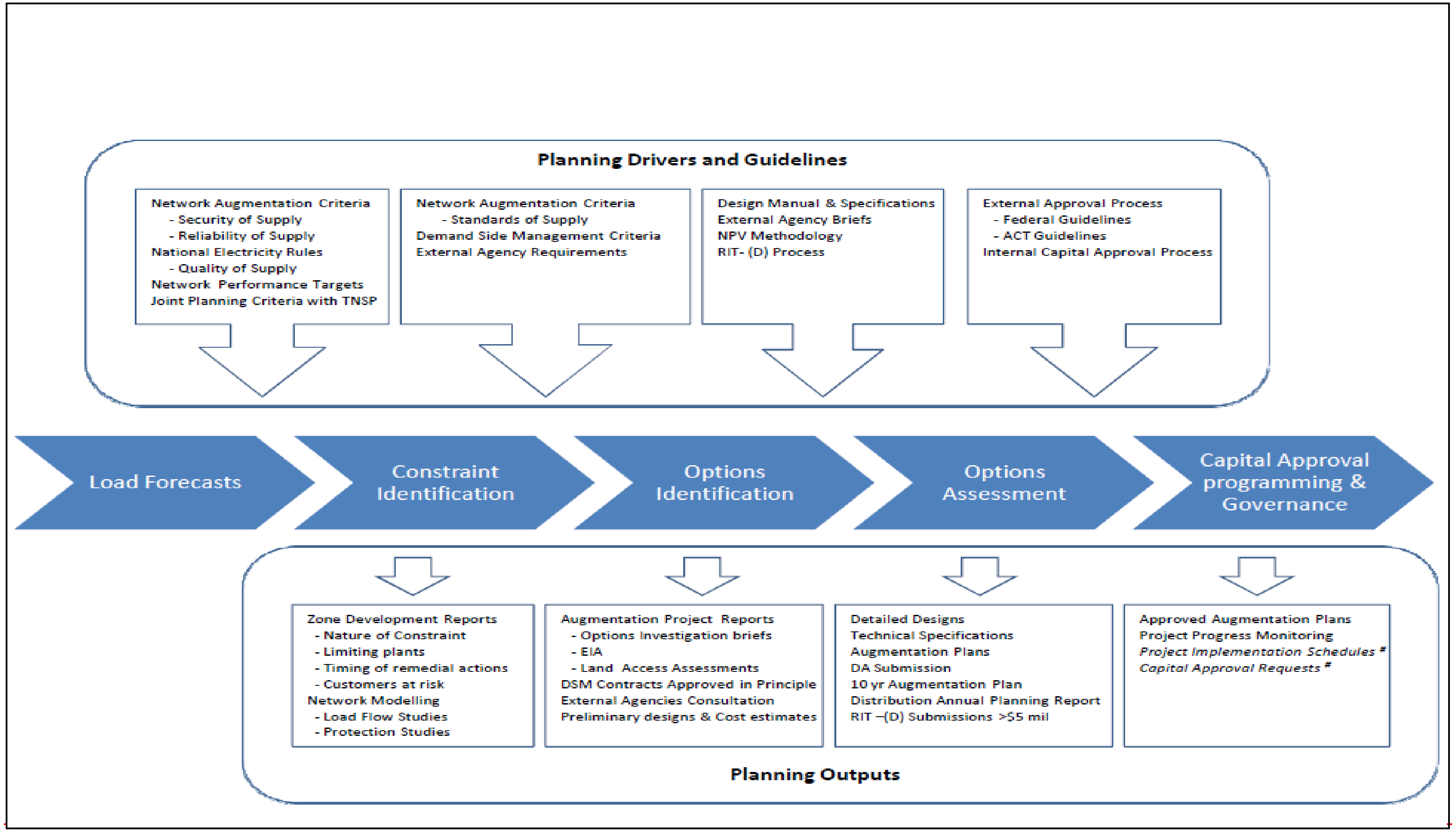
10.2.1.6 Advanced Distribution Management System Integrated High Voltage and Low Voltage Network Implementation

A system that provides the ability to manage the LV distribution network to the samelevel applied to the management of HV network.

10.2.1.7 Cityworks Stage Two Implementation

A system that delivers improvements to ActewAGL's Work management processes through streamlining of processes and removing data double handling, work force productivity is enhanced as well as developing tools for identifying minimum productivity standards.

Appendix A – Framework for Distribution Network Planning and Expansion



Appendix B – Embedded Generation Data

Small scale embedded generators installed within the ACT at 30th September 2013.

Suburb Name	Total Sites Connected	Total installed capacity (W)
Acton	1	2,040
Ainslie	231	579,435
Amaroo	202	553,224
Aranda	114	289,956
Banks	175	440,806
Barton	11	42,827
Belconnen	96	326,315
Belconnen District	7	89,329
Bonner	175	471,635
Bonython	154	376,697
Booth District	0	0
Braddon	33	127,453
Bruce	147	406,524
Calwell	232	667,777
Campbell	135	425,674
Canberra District	0	0
Capital Hill	0	0
Casey	104	285,419
Chapman	158	534,199
Charnwood	89	226,755
Chifley	92	237,061
Chisholm	214	588,115
City	4	72,705
Conder	206	632,459
Cook	143	404,132
Coree District	3	7,475
Cotter River District	0	0
Crace	53	158,495
Curtin	228	606,278
Deakin	123	364,091
Dickson	68	237,907
Downer	129	296,496
Duffy	164	429,938

Suburb Name	Total Sites Connected	Total installed capacity (W)
Hume	5	94,900
Isaacs	138	412,360
Isabella Plains	167	412,813
Jerrabomberra District	0	0
Kaleen	339	930,898
Kambah	768	2,065,901
Kingston	14	61,485
Kowen District	0	0
Latham	146	357,250
Lawson	0	0
Lyneham	115	484,422
Lyons	123	252,575
Macarthur	58	163,850
Macgregor	253	603,399
Macquarie	107	275,690
Majura District	0	0
Mawson	99	315,137
Mckellar	158	458,649
Melba	130	359,676
Mitchell	6	96,470
Monash	477	985,081
Narrabundah	162	411,344
Ngunnawal	282	669,786
Nicholls	336	938,796
NSW-North	6	28,155
Oaks Estate	8	23,232
O'Connor	212	541,871
O'Malley	41	148,024
Oxley	91	250,923
Paddys River District	5	13,630
Page	97	216,505
Palmerston	220	579,233
Parkes	1	1,700

Suburb Name	Total Sites Connected	Total installed capacity (W)
Dunlop	292	673,935
Evatt	242	684,112
Fadden	143	430,814
Farrer	142	364,367
Fisher	159	393,446
Florey	192	526,418
Flynn	160	419,096
Forde	177	472,665
Forrest	33	155,268
Franklin	218	483,776
Fraser	111	333,858
Fyshwick	16	438,943
Garran	123	382,866
Gilmore	118	328,175
Giralang	193	490,233
Gordon	292	734,496
Gowrie	104	300,663
Greenway	50	152,119
Griffith	88	287,753
Gungahlin	132	382,996
Gungahlin District	2	15,000
Hackett	116	299,487
Hall	13	123,383
Harrison	169	434,884
Hawker	159	519,027
Higgins	142	329,556
Holder	129	324,824
Holt	165	502,072
Hughes	103	283,423

Suburb Name	Total Sites Connected	Total installed capacity (W)
Pearce	95	284,137
Phillip	44	149,982
Pialligo	9	144,578
Red Hill	93	280,426
Reid	29	75,350
Rendezvous Creek District	0	0
Richardson	139	359,054
Rivett	145	366,357
Russell	0	0
Scullin	121	281,032
Spence	97	245,916
Stirling	117	308,327
Stromlo District	2	15,990
Symonston	0	0
Tennent District	0	0
Tharwa	3	7,560
Theodore	141	400,521
Torrens	87	250,254
Tuggeranong District	6	46,535
Turner	39	101,238
Uriarra Village	26	62,915
Wanniassa	317	879,156
Waramanga	114	332,831
Watson	183	462,150
Weetangera	124	346,262
Weston	165	430,676
Weston Creek District	0	0
Yarralumla	110	326,834
Totals	14,244	39,460,708

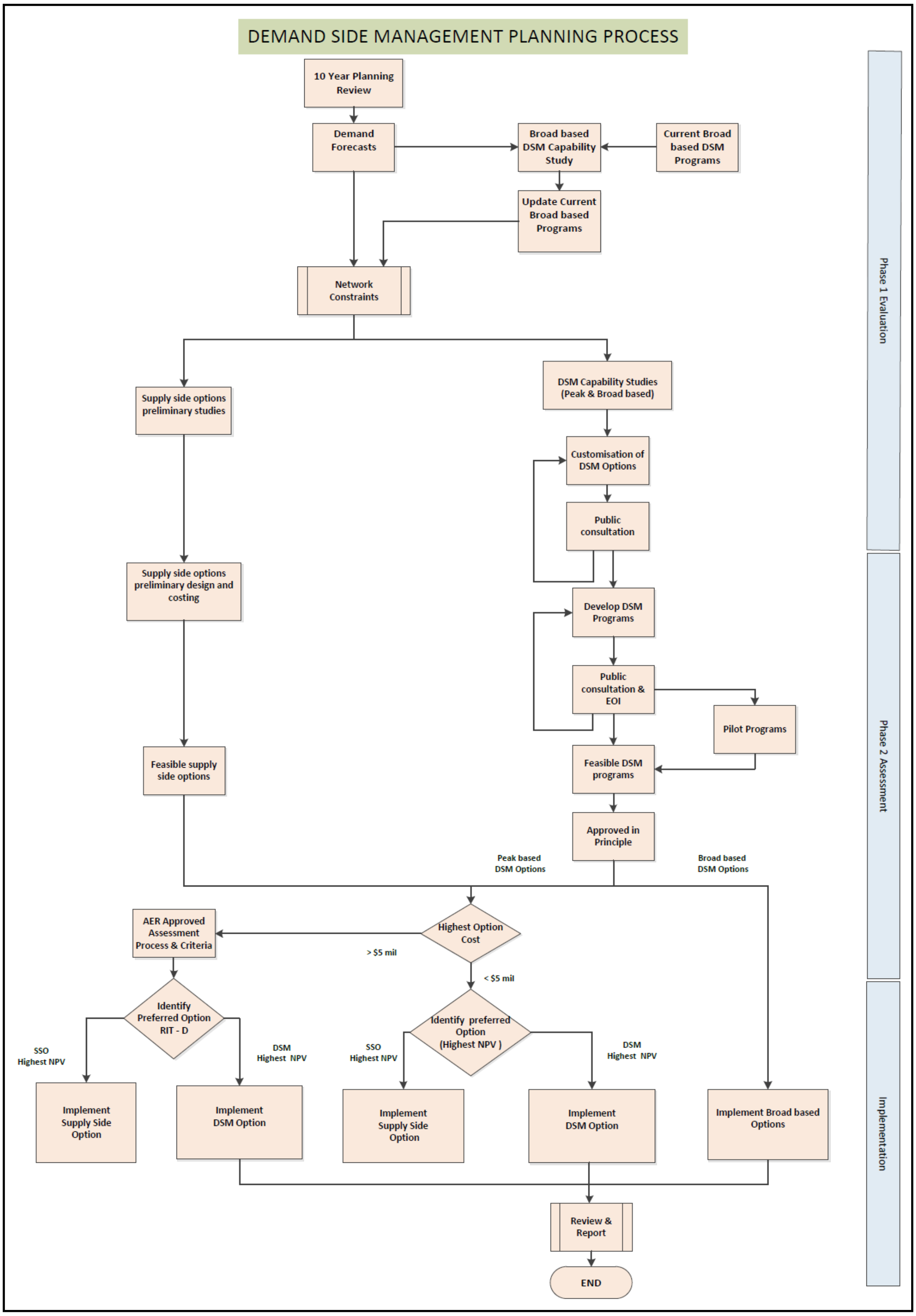
Appendix C – Transmission Line Ratings

LINE		CURRENT RATING (AMPS)			
		SUMMER DAY		WINTER DAY	
FROM	TO	CONTINUOUS	EMERGENCY	CONTINUOUS	EMERGENCY
Canberra	Woden	1950	2960	2540	3320
Canberra	Latham	1950	2958	2540	3320
Canberra	Gold Creek	1930	2920	2520	3280
Latham	Belconnen	1950	2960	2540	3320
Bruce	Belconnen	1930	2920	2520	3280
Bruce	Gold Creek	1930	2920	2520	3280
Bruce	Civic	1930	2930	2520	3290
Bruce	City East	970	1460	1260	1640
Bruce	Causeway	970	1460	1260	1640
Woden	Wanniassa	1990	3000	2590	3370
Civic	Woden	1950	2960	2540	3330
Causeway	City East	970	1460	1260	1640
Gilmore	Causeway	1930	2920	2510	3280
Wanniassa	Gilmore	1930	2960	2510	3280
Gilmore	Williamsdale	970	1460	1260	1640
Gilmore	Theodore	970	1460	1260	1640
Theodore	Williamsdale	970	1460	1220	1640
Causeway	Telopea Park	NA(1)	NA(1)	NA(1)	NA(1)
Fyshwick	Queanbeyan	500	840	820	1040

Appendix D – HV Feeder Constraints

Zone Substation	Feeder	Constraint type and timing	
		Firm rating exceeded	Thermal rating exceeded
Belconnen	Benjamin	Summer 2013	Summer 2015
City East	Binara	Summer 2013	
Civic	CSIRO	Summer 2013	
Civic	Wattle	Summer 2013	Summer 2013
Fyshwick	Whyalla	Summer 2013	Summer 2013
Gold Creek	Gungahlin	Summer 2013	
Gold Creek	Lander	Summer 2013	
Latham	Elkington	Summer 2013	
Latham	Fielder	Summer 2013	Summer 2015
Latham	Lhotsky	Summer 2013	
Latham	LM East	Summer 2013	
Telopea Park	Kelliher	Summer 2013	
Telopea Park	Riverside	Summer 2013	Summer 2015
Telopea Park	Sandalwood	Summer 2013	
Wanniassa	Fincham	Summer 2013	Summer 2013

Appendix E – Demand Side Management Planning Process



Appendix – DAPR 2014 Mid-Year Review

1. Purpose

To provide an update on the ActewAGL Distribution's planning activities for transmission and distribution network & expansion, including the following:

1. Load forecasts,
2. Future AAD Network assets in excess of $2M for forward planning period,
3. Network constraints at zone substations, and
4. Impacts of zone substation constraints and possible solutions.

2. Background

Since the publication of the original DAPR on 31st December 2013 a number of factors such as a revision of the peak demand forecast have caused a re-evaluation of forecast system constraints. The contents of this Mid-Year Review have now been incorporated into ActewAGL Distribution's Subsequent Regulatory Proposal for submission to the AER on 31 May 2014.

3. Load Forecasts

Table 1 below shows the load forecasts based on 10% and 50% POE as at 23rd May 2014. This forecast reflects the effect of the network solutions have been implemented since December 2013 and the anticipated outcome of the planned solutions within the 10 year planning period.

Table 1: Forecasts for Zone Substations (10% & 50% PoE) as at 23rd May 2014

Zone Substation		Belconnen		City East		Civic		Eastlake		Fyshwick		Gilmore		Gold Creek		Latham		Molonglo		Telpea Park		Theodore		Wanniassa		Woden	
Season		S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W
Rating	Continuous	55	55	95	112	110	110	50	50	50	50	45	45	57	57	95	100	25/50	25/50	100	100	45	45	95	100	95	100
	Emergency	63	76	95	114	114	143	0	0	50	50	62	69	76	76	95	114			114	114	62	69	95	114	95	114
Postupgrade	Continuous							100	100																		
	Emergency	74	76																								
Zone substation 50% PoE load forecast, MVA																											
2014		55.75	53.05	74.95	66.75	66.03	61.63	8.25	16.50	40.50	25.95	22.20	26.80	49.20	55.60	56.38	72.68	0.00	0.00	99.55	94.15	29.80	30.40	73.40	80.20	81.70	79.90
2015		60.30	57.60	74.25	66.35	70.63	66.23	16.58	16.67	33.65	26.858	22.90	27.70	50.05	56.45	57.08	72.88	0.00	0.00	101.55	95.25	30.60	30.40	74.00	79.30	77.50	74.70
2016		60.30	57.60	73.45	65.95	70.63	66.23	16.75	34.08	35.05	18.75	23.60	28.60	53.15	59.55	57.78	72.88	0.00	0.00	102.65	88.20	31.40	30.40	74.60	78.30	77.50	73.70
2017		60.30	57.60	72.55	65.55	70.63	66.23	34.17	46.12	27.35	7.95	24.30	29.40	56.15	62.65	58.48	72.88	0.00	0.00	95.50	89.30	32.20	30.40	75.20	77.30	77.50	72.70
2018		60.30	57.60	71.75	65.15	70.63	63.98	46.21	46.58	17.05	8.85	25.00	30.30	59.25	65.75	59.18	72.88	0.00	10.4	96.60	90.40	33.00	30.40	75.80	76.30	77.50	66.10
2019		60.30	57.60	70.95	64.75	68.38	63.98	46.67	47.05	18.45	9.85	25.70	31.20	62.35	68.85	59.88	72.88	10.4	10.93	97.70	91.60	33.90	30.40	76.40	75.30	71.80	65.10
2020		60.30	57.60	70.15	64.35	68.38	63.98	47.14	47.52	19.75	10.75	26.40	32.10	65.45	71.95	60.58	72.88	10.93	11.48	98.80	92.70	34.70	30.40	77.00	74.30	71.80	64.10
2021		60.30	57.60	69.35	63.95	68.38	63.98	47.61	48.00	21.15	11.65	27.10	33.00	68.55	75.15	61.28	72.88	11.48	12.02	99.90	93.90	35.50	30.40	77.60	73.30	71.80	63.20
2022		60.30	57.60	68.55	63.55	68.38	63.98	48.08	48.48	22.55	12.55	27.80	33.80	71.55	78.25	61.98	72.88	12.02	12.66	101.00	95.00	36.30	30.40	78.20	72.30	71.80	62.20
2023		60.30	57.60	67.75	63.15	68.38	63.98	48.56	48.96	23.85	13.45	28.50	34.70	74.65	81.35	62.68	72.88	12.62	13.29	102.10	96.10	37.10	30.40	78.80	71.30	71.80	61.20
Zone substation 10% PoE load forecast, MVA																											
2014		59.95	53.45	80.35	67.05	68.33	62.13	8.25	16.50	42.70	26.35	23.10	26.80	52.20	55.70	60.38	73.08	0.00	0.00	104.85	94.85	31.00	30.60	79.10	80.60	85.40	80.80
2015		64.50	58.00	79.65	66.75	72.83	66.73	16.58	16.67	35.85	27.25	23.80	27.70	53.05	56.65	61.08	73.28	0.00	0.00	106.95	95.95	31.80	30.60	79.70	79.60	81.20	75.70
2016		64.50	58.00	78.85	66.35	72.83	66.73	16.75	34.08	37.15	19.15	24.50	28.60	56.15	59.75	61.78	73.28	0.00	0.00	107.95	88.90	32.60	30.60	80.30	78.60	81.20	74.70
2017		64.50	58.00	77.95	65.95	72.83	66.73	34.17	46.12	29.55	8.35	25.20	29.40	59.25	62.85	62.48	73.28	0.00	0.00	100.80	90.00	33.40	30.60	80.90	77.60	81.20	73.70
2018		64.50	58.00	77.15	65.55	72.83	64.48	46.21	46.58	19.25	9.25	25.90	30.30	62.35	65.95	63.18	73.28	0.00	11.2	101.90	91.20	34.30	30.60	81.50	76.60	81.20	67.10
2019		64.50	58.00	76.35	65.15	70.58	64.48	46.67	47.05	20.65	10.15	26.60	31.20	65.45	69.05	63.88	73.28	11.2	11.76	103.00	92.30	35.10	30.60	82.10	75.60	75.50	66.10
2020		64.50	58.00	75.55	64.75	70.58	64.48	47.14	47.52	21.95	11.05	27.30	32.10	68.45	72.15	64.58	73.28	11.76	12.34	104.10	93.40	35.90	30.60	82.70	74.60	75.50	65.10
2021		64.50	58.00	74.75	64.35	70.58	64.48	47.61	48.00	23.35	11.95	28.00	33.00	71.55	75.25	65.28	73.28	12.34	12.96	105.20	94.60	36.70	30.60	83.30	73.70	75.50	64.10
2022		64.50	58.00	73.95	63.95	70.58	64.48	48.08	48.48	24.75	12.85	28.70	33.80	74.65	78.35	65.98	73.28	12.96	13.61	106.30	95.70	37.50	30.60	83.90	72.70	75.50	63.20
2023		64.50	58.00	73.15	63.55	70.58	64.48	48.56	48.96	26.05	13.75	29.40	34.70	77.75	81.45	66.68	73.28	13.61	14.29	107.40	96.90	38.40	30.60	84.50	71.70	75.50	62.20

4. Future ActewAGL Distribution Assets above $2M

Future assets have been identified through the planning process for the forward planning period. Load forecasts and new major customer connection requests have been the input for the maximum demand forecasting. Table 2 below shows the future assets and the timing of their completion.

Table 2: Future ActewAGL Distribution Network Assets in excess of $2M for Forward Planning Period

Asset Type	Description	Timing of Completion	Cost
TransGrid – ActewAGL Connection Points	Nil	NA	
Transmission Lines	Upgrade of existing 132kV Gilmore – Theodore Transmission line section to match transfer capability of the rest of the transmission network	2017/18	$9.65M
Zone Substations	Installation of Belconnen Zone Substation Transformer No.3 to increase substation rating	2018/19	$12.72M
	New Molonglo Zone Substation	2018/19	$24.6M
HV 11kV Feeders	New 11kV feeder for Australian Data Centre HV Supply stage 2 from Gold Creek Zone Substation	2015	$3.19M
	New 11kV feeder to Belconnen Trade Service Area from Latham Zone Substation	2019	$2.1M
	New 11kV feeder for Tuggeranong Town centre from Wanniassa Zone Substation	2018	$2.69
	New 11kV feeders and inter-zone feeder ties from East La Zone Substation Stage 2	2016	$2.0M
	New 11kV feeders and inter-zone feeder ties from East Lake Zone Substation Stage 3	2018	$2.0M

The assets in Table 2 are the likely solutions to address anticipated network constraints and performance issues. ActewAGL Distribution will consult with non-network providers and customers to take advantage of any emerging non-network options before committing to the final solutions to address these issues.

5. Network Constraints at Zone Substations

Table 3 & 4 below show the network constraints and their impacts at zone substation level. DAPR 2013 identified the zone substation constraints and documented in Table 7 & 8 and the tables below provide the updates for these original tables.

Table 3: Zone Substation Constraints

Zone Substation	MVA			
	Summer		Winter	
	2h Emergency Rating	Forecast Load	2h Emergency Rating	Forecast Load
East Lake	0	**8.25**	0	**16.5**
Gold Creek	76	**77.75**	76	**78.35**

Table 4: The Impacts of Zone Substation Constraints

Demand in excess of rated capacity		System Impact	Estimated Time and Duration of Impact
Zone substation	MVA		
East Lake	16.5	Supply security and reliability	January 2014, continuous
Gold Creek	2.35	Supply security and reliability	January 2022, continuous

Table 5: Possible Solutions for Zone substation constraints

Demand in excess of rated capacity		Potential Solutions (MVA)			Potential Solutions Total (MVA)
Zone substation	MVA	New Equipment	Load Transfer	Demand Management	
East Lake	16.5	16.5	0	2	18.5
Gold Creek	2.35	0	1	2	3