SA Power Networks
Annual Pricing Proposal 2014-2015

Appendix E: Long Run Marginal Cost Methodology

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SA Power Networks

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Contents

1 Introduction

This Appendix to SA Power Networks' 2014/15 Pricing Proposal (Pricing Proposal) sets out the methodology which SA Power Networks has developed to determine the Long Run Marginal Cost (LRMC) of supply for its standard control services tariff classes. This method was established in 2010/11 and had minor update since then.

This LRMC is taken into account by SA Power Networks in setting the charging parameters of its distribution tariffs, in accordance with the provisions of clause 6.18.5(b)(1) of the Rules.

The consideration of LRMC applies where price signalling charging parameters (peak period energy and demand related components) form part of a tariff. SA Power Networks aims to ensure that where price signals are varied, they are moved in such a direction as to improve alignment with the LRMC. Charging components that materially over-recover or under-recover the LRMC would not pass on an efficient pricing signal to customers that represents their cost of utilising the network.

Where such price signalling charging parameters of a tariff do not recover sufficient revenue to cover the capital, operating and maintenance costs of the existing assets, the shortfall is recovered through a charging component that minimises distortion of the customers' consumption decisions, such as a fixed daily charge or off peak energy charge. This is in accordance with the requirement in clause 6.18.5(c) of the Rules.

2 Approach used to calculate LRMC

In the context of an infrastructure business with assets lives of typically 40 years, short run costs are effectively zero, up to the point where the capacity of the network is exceeded. It is therefore important to use the Long Run Marginal Cost (LRMC) in any consideration of the marginal cost of providing network service. In this context, the long run refers to a situation in which the investment in plant and equipment is variable.

There are three general approaches to the calculation of LRMC. Marsden Jacob Associates articulated these alternatives, in its review of possible approaches for the Queensland Competition Authority. This review was undertaken in the context of determining efficient prices for the Gladstone Area water Board. The alternatives are as follows[1]:

- ***Marginal Incremental Cost*** (MIC) - where a scenario involving increased demand is tested for its incremental effect on capex. The associated marginal cost is calculated as the difference between the present value of the investment programs divided by the increment in demand;
- ***Average Incremental Cost*** (AIC) - is the present value of the incremental investment associated with increasing demand divided by the present value of the increment in demand; and
- ***Long Run Incremental Cost*** (LRIC) - is the annuitised value of the capital expenditure divided by the increment in demand.

In comparing the suitability of these three approaches, the first requires scenario definition and analysis, which although not impracticable would be very resource intensive in the context of SA Power Networks' distribution business.

[1] Marsden Jacob Associates, Estimation of Long Run Marginal Cost (LRMC) - A report prepared by the Queensland Competition Authority - Final, 3 November 2004

Marsden Jacob make the point that because the AIC approach is based on a long term planning period, it takes a longer view of costs and provides more stable prices than the LRIC approach[2].

The approach used by SA Power Networks in this Pricing Proposal to determine the LRMC of its tariff classes may be characterised as the AIC. However, the calculation has been extended to incorporate the incremental operating cost associated with new capital investment. This is the same as the approach taken by EnergyAustralia in its 2009 Pricing Proposal[3].

The AIC may be expressed algebraically as follows:

$$LRMC(AIC) = \frac{PV(growth\ \ related\ \ capex) + PV(growth\ \ related\ \ opex)}{PV(incremental\ \ demand)}$$

Where:

> *growth related capex* is the annualised capital expenditure to meet the additional demand and new customer connections forecast over the forecast period;
>
> *growth related opex* is the incremental annual cost of operating and maintaining the newly constructed network and connection assets over the forecast period; and
>
> *incremental demand* is the forecast change in kVA demand compared with the base year of 2009-10

The network is augmented to provide additional capacity for the connection of additional demand. Since the network capacity to supply demand is measured in units of kVA, the LRMC is calculated as the annualised cost per unit of additional network kVA capacity, in $/kVA per annum.

3 Process employed

For the purpose of complying with the Rules, the LRMC calculation is required for each of the SA Power Networks' four tariff classes:

- Major business;
- High Voltage business;
- Low Voltage Business; and
- Low Voltage Residential.

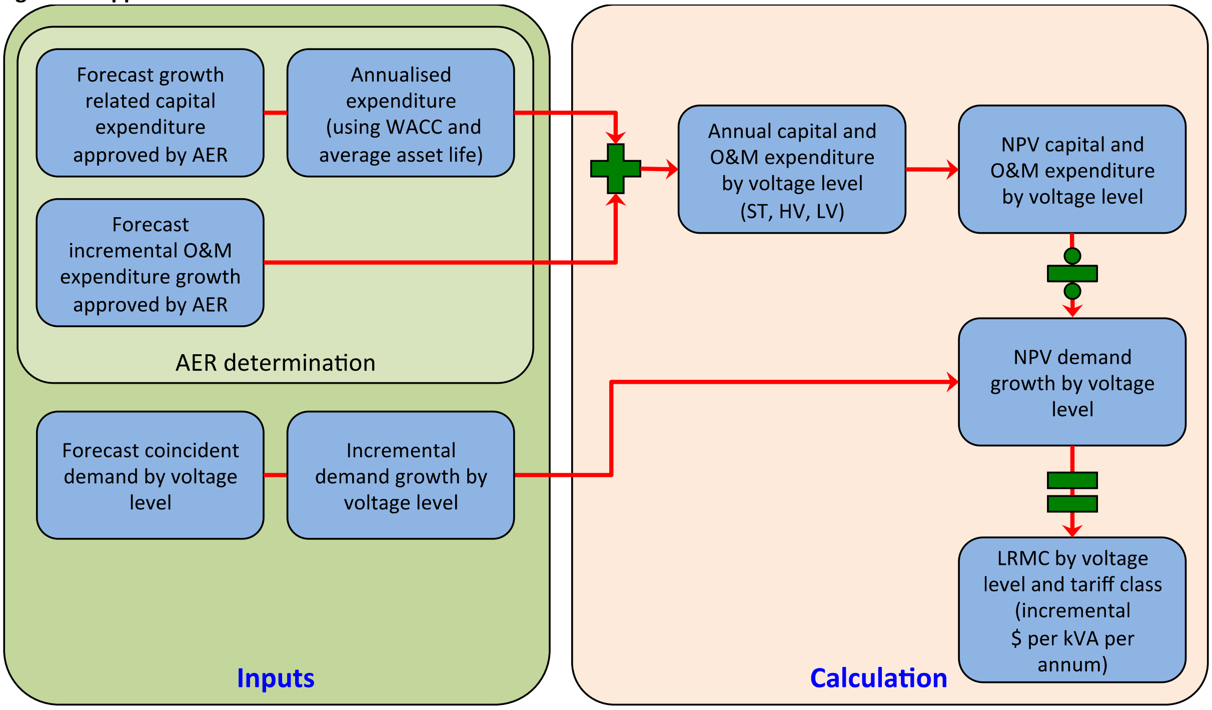
As these tariff classes involve customers connected at different levels of the network, the calculations of LRMC must be carried out for the following levels of the network:

- Subtransmission;
- High voltage; and
- Low voltage.

The process employed by SA Power Networks in the calculation of the network LRMC for its tariff classes is illustrated in the flow diagram in Figure 1.

[2] Marsden Jacob, LRMC, November 2004, p.16.
[3] EnergyAustralia, Network Pricing Proposal, May 2009.

Figure 1 - Approach used to calculate LRMC for tariff classes



The left hand side of Figure 1 shows the basic forecast inputs to the calculation: capex; opex; and demand. The right hand block depicts the process by which the LRMC (AIC) is determined for the levels of the network and tariff classes.

4 Capex and opex forecasts

The capex and opex forecasts used to determine the LRMC should ideally be for a period commensurate with the life of the assets employed. This clearly is not practicable for assets with service lives of 30 to 40 years, but the forecast should extend as far into the future as possible.

A forecast period of 10 years (to 2020) has been used by SA Power Networks, since this forecast was prepared in the course of developing estimates for the regulatory proposal to the AER. The forecasts for the 2010-15 regulatory control period are the same as those provided to the AER.

4.1 Capital expenditure forecast

A summary of the growth related capital expenditure forecast used by SA Power Networks for the LRMC calculation is shown in Table 1.

Table 1 - Growth related capital expenditure forecast ($'000 real 2010-11)[4]

Asset class	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Subtransmission	24,005	63,482	84,114	32,871	25,648	25,055	37,227	45,765	37,290	80,278	92,514
Zone substations	23,246	28,588	45,255	52,440	50,829	46,444	44,139	47,867	30,079	26,530	31,021
HV network	33,182	16,172	18,537	16,253	19,484	19,174	16,524	16,720	16,964	16,446	16,558
Distribution substations	77,383	28,844	30,159	28,820	29,977	30,189	31,066	31,713	32,481	33,390	34,471
LV network	17,357	7,148	7,299	7,118	7,228	7,362	7,585	7,749	7,943	8,173	8,447
Services	14,833	3,508	3,368	3,331	3,272	3,387	3,395	3,404	3,414	3,426	3,441
LV Network & Services	32,190	10,656	10,667	10,449	10,500	10,750	10,980	11,153	11,358	11,600	11,888
Total standard control	**190,006**	**147,741**	**188,733**	**140,834**	**136,438**	**131,612**	**139,936**	**153,218**	**128,172**	**168,244**	**186,453**

The forecast for the 2010-15 regulatory control period is the same as that provided to the AER in SA Power Networks' regulatory proposal and accepted by the AER in its Decision for the 2010-15 regulatory control period. The forecast from 2015-20 has been estimated by SA Power Networks' planners in the course of developing longer term strategic options for the development of the network.

4 This capital expenditure forecast includes two components of the costs submitted to the AER: in respect of growth related augmentation of the network; and SA Power Networks' component of costs associated with new customer connections (net of capital contributions).

4.2 Operating expenditure forecast

The corresponding incremental operating expenditure, associated with operating and maintaining the new augmentation and connection assets, is shown in Table 2.

Table 2 - Growth related operating expenditure forecast ($'000 real 2010-11)[5]

Asset class	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Subtransmission	428	1,783	980	403	381	367	614	754	615	1,323	1,525
Zone substations	414	803	527	643	754	681	728	789	496	437	511
HV network	591	454	216	199	289	281	272	276	280	271	273
Distribution substations	1,379	810	351	353	445	442	512	523	535	550	568
LV network	574	299	124	128	156	158	181	184	187	191	196
Total	**3,387**	**4,150**	**2,199**	**1,727**	**2,025**	**1,929**	**2,307**	**2,525**	**2,113**	**2,773**	**3,073**

The operating expenditure forecast is the same as that provided to the AER in SA Power Networks' regulatory proposal and accepted by the AER in its Decision for the 2010-15 regulatory control period. The forecast from 2015-20 has been estimated as an average proportion of the value of the capital costs in this period, from the capital expenditure forecast in Table 1.

[5] This operating expenditure forecast includes only the components of cost associated with growth in operating expenditure due to increases in the size of the network, number of customers, number of employees and amount of work being undertaken on the network (ie. expenditure associated with SA Power Networks' 'scale' escalators).

4.3 Demand forecast

The demand forecast over the 10 year period is shown in Table 2. The forecast quantities are coincident with the peak demand on SA Power Networks' network and have a 10% Probability of Exceedence (PoE). Forecasts with a 10% PoE are used in planning the capacity of the network to meet the expected demand.

Table 3 - Coincident demand forecast (MVA)[6]

Tariff class	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Major business	218	230	254	262	271	271	278	286	294	298	305
HV business	237	244	250	255	257	262	268	276	284	288	294
LV business	1,338	1,374	1,408	1,436	1,451	1,475	1,512	1,555	1,601	1,622	1,658
LV residential	1,613	1,678	1,741	1,795	1,823	1,869	1,940	2,023	2,112	2,153	2,233
Total	**3,406**	**3,525**	**3,653**	**3,749**	**3,803**	**3,877**	**3,998**	**4,140**	**4,292**	**4,361**	**4,490**

This forecast is consistent with the global MW demand forecast that the AER used for SA Power Networks' regulatory Decision. The forecast of coincident MVA contributions for tariff classes has required some additional estimation, and includes adjustments for the measured power factor of customer loads at the time of coincident peak demand.

[6] The demand forecasts in this table are of the coincident contribution of each tariff class to SA Power Networks' overall peak demand, with a 10% PoE. These forecast tariff class demands differ from the individual peak demand of each tariff class.

5 LRMC outcomes

The outcome from applying the calculation process described in this document to SA Power Networks' tariff classes is shown in Table 4.

Table 4 - Calculated LRMC for SA Power Networks' network ($2009/10)

Tariff class	LRMC, $/kVA per annum
Major business	$41
HV business	$91
LV business	$134
LV residential	$146

In Table 5 the LRMC outcome has been updated for 2014/15, by indexation with the cumulative CPI of 1.1395 since 2009/10.

Table 5 - Calculated LRMC for SA Power Networks' network ($2014/15)

Tariff class	LRMC, $/kVA per annum
Major business	$46
HV business	$104
LV business	$152
LV residential	$166

These estimates have been used in the 2014/15 Pricing Proposal.

The LRMC outcomes at the subtransmission and high voltage levels are directly applicable to the Major Business and High Voltage Business tariff classes. At low voltage, the small difference between the LRMC of the Low Voltage Business and Residential tariff classes arises because of their different power factors.