SA Power Networks

Annual Pricing Proposal 2016/17

Appendix F - Stand-alone and avoided cost methodologies

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Contents

1 Introduction

This Appendix to SA Power Networks' 2016/17 Pricing Proposal (Pricing Proposal) sets out the methodology that SA Power Networks has developed to determine the Stand-alone cost and the Avoidable cost of supply, for its standard control services tariff classes. This methodology was established in 2010/11.

These costs are used by SA Power Networks in establishing the prices for standard control services, as clause 6.18.5(a) of the Rules requires SA Power Networks to ensure that the revenue recovered for each tariff class lies between:

- An upper bound, representing the stand-alone cost of serving the customers who belong to that class; and
- A lower bound, representing the avoidable cost of not serving those customers.

The Stand-alone and Avoidable cost methodologies in this Appendix are used to calculate the revenues for each standard control services tariff class associated with each cost. These costs are compared with the weighted average revenue derived from SA Power Networks' proposed tariffs.

2 Definition of Stand-alone and Avoidable costs

These two categories of cost may be defined for tariff classes, as follows:

- The ***Stand-alone cost*** for a tariff class is the cost of supplying only the tariff class concerned, with all other tariff classes not being supplied. If customers were to pay above the stand-alone cost, then it would be economically beneficial for customers to switch to an alternative provider. It would also be economically feasible for an alternative service provider to operate. This creates the possibility of inefficient bypass of the existing infrastructure; and
- The ***Avoidable cost*** for a tariff class is the reduction in network cost that would take place if the tariff class were not supplied (whilst all other tariff classes remained supplied). If customers were to be charged below the avoidable cost, it would be economically beneficial for the business to stop supplying the customers and as the associated costs would exceed the revenue obtained from the customer.

There are two alternative concepts that could be used to calculate these costs:

- To ignore the sunk nature of the existing network and estimate the costs which would be associated with an optimally designed network, constructed to supply standard control services to the tariff class or classes concerned; or
- To base the estimation of costs on the modification of the existing network to provide standard control services to the tariff class or classes concerned.

The Rules do not prescribe the methodology that should be used to calculate the Stand-alone and Avoidable costs of tariff classes of the network. SA Power Networks has chosen to base its cost estimations on the second concept, based on the hypothetical modification of the existing network, rather than by devising and costing optimal new network structures. This has been done for two reasons:

- To avoid the very substantial resource requirements that would be involved in a full network redesign; and

- In recognition that the economic regulatory framework for distribution supports the existence and value of existing (sunk) network investments and does not support the optimisation of existing networks.

SA Power Networks' approach is thus conceptually the same as that which was employed by Integral Energy in its 2009 Pricing Proposal, and subsequently approved by the AER[1].

3 Process employed

The derivation of the stand-alone and avoidable cost for tariff classes uses a methodology derived from SA Power Networks' cost of supply model. The cost of supply model has been in use for a decade and was formulated to permit the efficient allocation of network costs to tariff classes and the formulation of network prices.

3.1.1 SA Power Networks' cost of supply model

In common with other network service providers, SA Power Networks employs a three-step process for the formulation of its distribution prices. The three steps are as follows:

1. Determination of the annual revenue requirement (by the AER), which the tariffs are set to recover;
2. Allocation of that revenue as a cost to network users; and
3. Conversion of the allocated cost to a variable price for the use of the network.

The building block network revenue is firstly allocated on the basis of the undepreciated value of the assets employed to each level of the network as follows:

- Subtransmission;
- Zone substations;
- High Voltage Distribution;
- Distribution substations; and
- Low Voltage distribution network.

Within the cost pools, the allocation of costs between tariffs is on the basis of their relative contribution to peak demand and their peak period energy consumption.

The cost of supply model provides an indication of the relative recovery of costs by distribution tariffs and the direction in which prices need to be trended to improve their cost reflectivity. The model also calculates the forecast revenue obtained through pricing, which is reconciled with the annual revenue requirement.

[1] Integral Energy, Direct Control Services - Initial Pricing Proposal 2009/10, 25 May 2009, p. 66-67.

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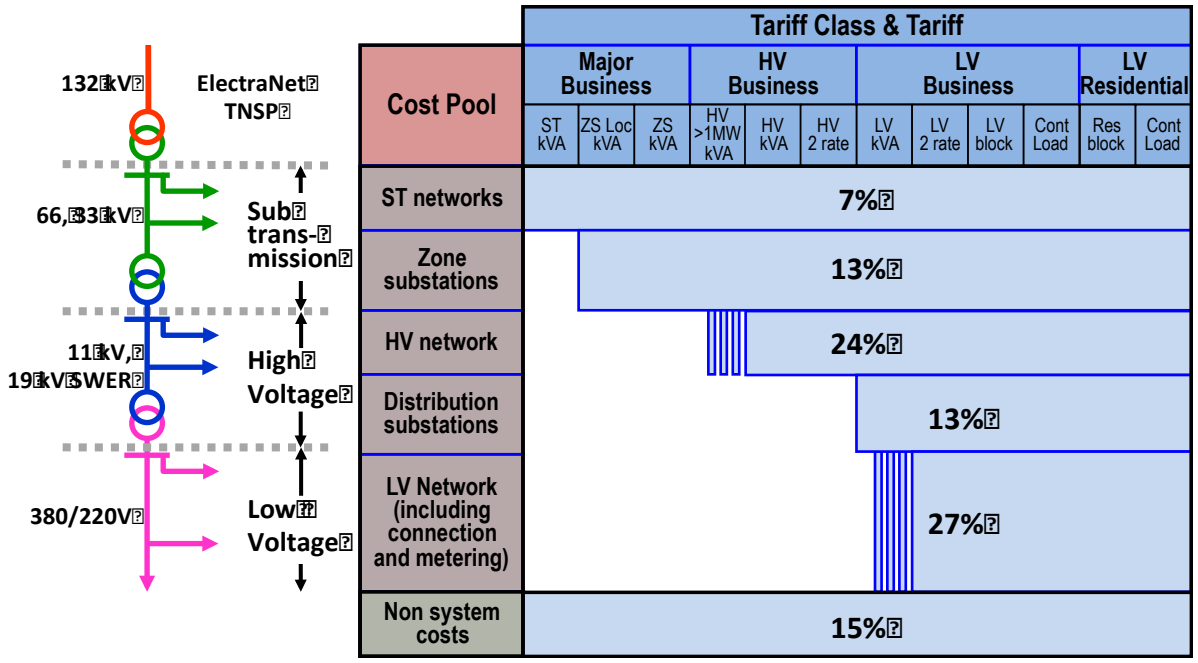
SA Power Networks' approach to the allocation of costs to tariffs and tariff classes, derived from the cost of supply model for the purposes of this Pricing Proposal, is illustrated in Figure 1. The percentages shown in this illustration are proportions of the annual revenue associated with elements of the supply system and with non system related costs.

Figure 1 - Cost allocation approach



The LV Business tariff class has been split at the LV kVA component into two tariff classes – large LV business and small business. This revised cost allocation model has been used as the basis for SA Power Networks' consideration of the stand-alone and avoidable costs of the five tariff classes.

4 Stand-alone costs

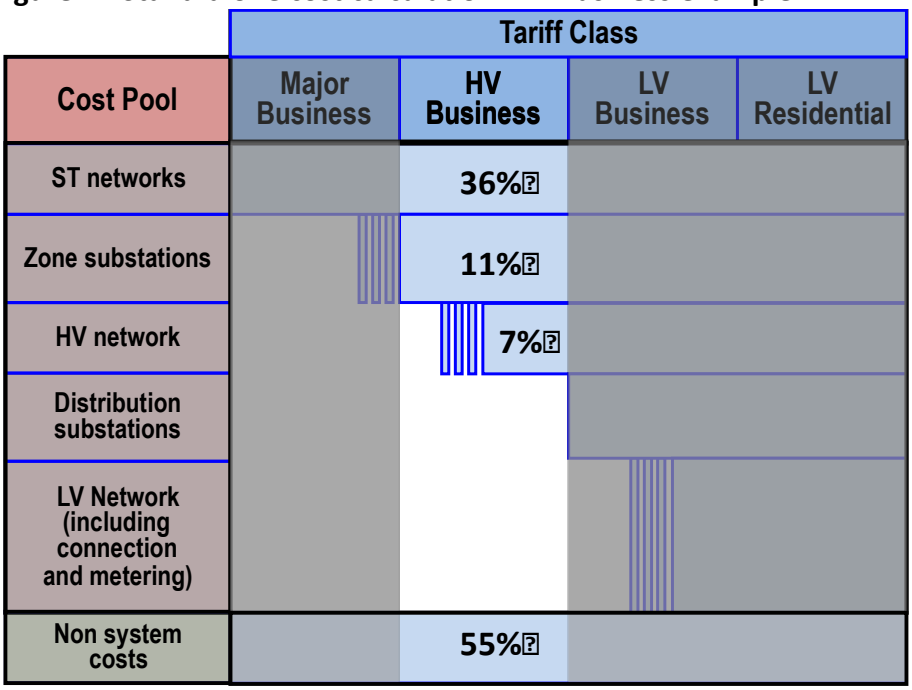
The stand-alone cost for each tariff class was derived from an engineering estimate of the proportions of the network capacity (and associated cost) that would need to remain in place to service the load. This estimate is made for each of the four tariff classes in turn.

In so doing, SA Power Networks' network planners reassessed the required network capacity at each level of the network in response to the following hypothetical question:

> *"If XX tariff class were the only one supplied from the network, what percentage reduction in the cost of existing assets employed to service category YY could be made but still enable the same standard of network service to be provided to tariff class XX."*

The process followed is illustrated in Figure 2, for the High Voltage Business tariff class.

Figure 2 - Stand-alone cost calculation: HV Business example



In Figure 2, the proportions of the subtransmission, zone substation and high voltage networks that would be required to service the High Voltage Business tariff class are shown.

It should be noted that this hypothetical reduction in the coincident system demand to around 8%, for the HV Business customer class standing alone, would not provide a commensurate reduction in the costs of each asset class. Because High Voltage customers are dispersed throughout SA Power Networks' territory, the required proportion of the subtransmission network (which services all tariff classes) is higher, at 36%.

Likewise, it is estimated that approximately 11% of the costs associated with zone substations would be required to service the High Voltage Business tariff class alone.

The resulting cost allocation for each tariff class was expressed in $/kVA, using the estimated coincident contribution to SA Power Networks' peak system demand and after adjustment for the average power factor of the tariff class.

The process followed in relation to determining the stand-alone proportions for each system level cost category is set out in the following sub sections.

4.1 Subtransmission

A detailed review of the subtransmission lines that support supply to each of the customer tariff classes, either directly or through downstream infrastructure was made. The relative line lengths were then used to apportion the costs of this asset class.

4.2 Zone and small substations

Substations can be divided into two categories:

- Zone Substations (with installed capacity ≥ 10 MVA) and

- Small Substations (with installed capacity < 10 MVA).

SA Power Networks' network contains approximately 161 Zone Substations and 240 Small Substations comprising 4,451 MVA of installed transformer capacity.

The standalone costs of customer tariff classes were estimated as a proportion of the total installed transformer capacity utilised by the tariff class, with allowance for dedicated substations at 8 major business customer sites.

4.3 High Voltage network

The relative line lengths were also used to apportion the costs of this asset class.

The proportion of the High Voltage network utilised by major customers is 3%, involving a number of short dedicated feeders. For the High Voltage Business class in Figure 2, this proportion is 7%.

The remainder of this network used by the 183 High Voltage business tariff class customers and the Low Voltage tariff classes. The stand-alone costs for each of these tariff classes were estimated from the typical configuration of supply from the High Voltage network in metropolitan and rural areas.

4.4 Distribution substations

The major business and High Voltage business tariff classes do not use this distribution infrastructure.

SA Power Networks has an extensive rural network, and as a consequence 75% of its distribution substations supply a single customer. The stand-alone costs of these assets were allocated directly to the low voltage business (large LV business and small business) and residential customer classes concerned. The remaining shared distribution substations were allocated to these customer classes after allowance for their respective capacity shares.

4.5 Low Voltage network and services

The major business, High Voltage business and Large LV business tariff classes do not use this distribution infrastructure.

The stand-alone costs for each of Low Voltage tariff classes were estimated from the typical configuration of supply from the Low Voltage network in metropolitan and rural areas. Consideration was given to proportioning the costs network in mixed supply areas, taking into account the use of assets in both normal and outage conditions.

4.6 Non system costs

Non system costs were considered in the following categories:

- Invariant, where the cost is not expected change in the event that only one tariff class was retained;
- Customer related, where the costs vary (although not proportionately) with the number of customers in the stand- lone tariff class; and

- IT related, where the costs also would vary (although not proportionately) with the number of customers in the stand- lone tariff class.

4.7 Summary of Stand-alone costs

The stand-alone costs of SA Power Networks' four tariff classes, estimated from existing system costs using the approach above are set out in Table 1. The percentage figures represent the stand-alone proportion of the total annual costs (cost pool), associated with each level of the network resulting from the above adjustments for equipment numbers and capacity. The percentages, when applied to the cost pool, result in the costs shown and have been updated as proportions of the forecast 2015/16 distribution revenue of $682 million.

Table 1 - Stand-alone costs of tariff classes ($million p.a., 2016/17)

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Network level	**Cost Pool**	**Tariff class**									
		Major business		**HV business**		**Large LV Business**		**Small business**		**LV residential**	
Subtransmission	53	*37%*	20	*36%*	19	*48%*	25	*48%*	25	*98%*	52
Zone/small substations	97	*8%*	8	*11%*	10	*40%*	39	*40%*	39	*86%*	84
HV network	179	*3%*	5	*7%*	13	*39%*	70	*39%*	70	*92%*	164
Distribution substations	92	*0%*	0	*0%*	0	*32%*	29	*32%*	29	*55%*	51
LV network and services	202	*0%*	0	*0%*	0	*0%*	0	*32%*	65	*90%*	183
Non system costs	110	*53%*	58	*55%*	60	*73%*	80	*73%*	80	*97%*	106
Total	**734**		**91**		**102**		**244**		**308**		**641**

5 Avoidable costs

In similar manner to the stand-alone cost, an engineering estimate was made of the proportions of the network capacity (and associated cost) that could be avoided, in the event that each of the four tariff classes were to be removed in turn.

This time, SA Power Networks' network planners assessed the required network capacity at each level of the network, in response to the following hypothetical question:

> *"If XX tariff class were no longer supplied from the network, what percentage reduction in the cost of existing assets employed to service category YY could be made but still enable the same standard of network service to be provided to all remaining tariff classes."*

The process followed to develop estimates of the avoidable cost is illustrated in Figure 3, again for the High Voltage Business tariff class.

Figure 3 - Avoidable cost calculation: HV Business example

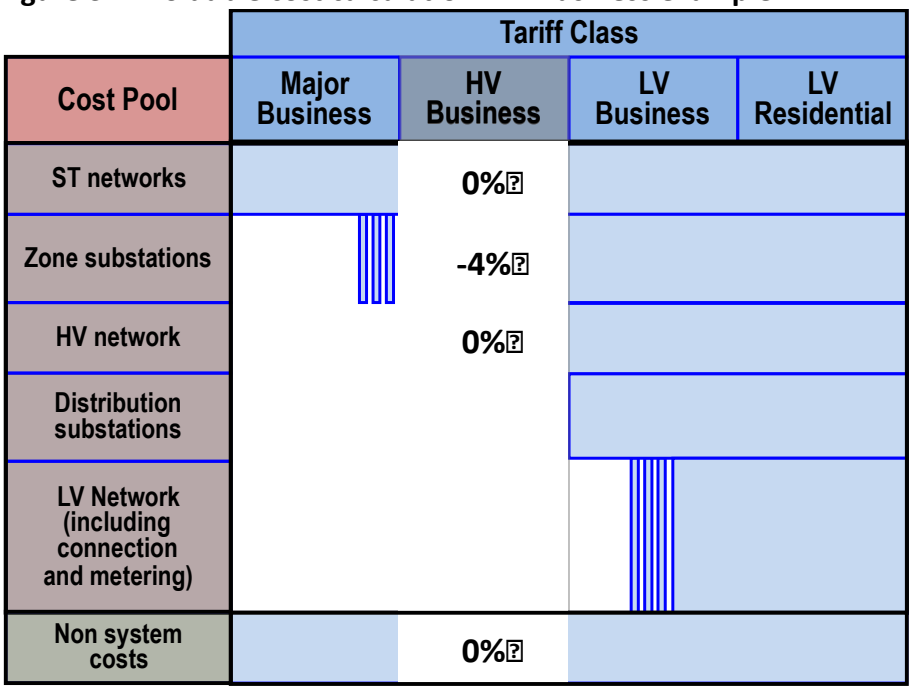

Figure 3 displays the remaining costs at different levels of the network to service the remaining tariff classes. For instance, it is estimated that a reduction of approximately 4% of the costs associated with zone substations would be possible if the High Voltage Business tariff class were not supplied.

It should be noted that a hypothetical reduction in the coincident system demand of around 8% would occur if the HV Business tariff class were avoided. Again, this does not provide a commensurate reduction in the costs of each asset class. Because other customer classes are dispersed throughout SA Power Networks' territory, no costs associated with the subtransmission network would be avoided.

As with the avoidable cost, the avoidable network cost was expressed in $/kVA for each tariff class.

The process followed in relation to determining the avoidable proportions for each system level cost category is set out in the following sub sections.

5.1 Subtransmission

A detailed review of the subtransmission lines that support supply to each of the customer tariff classes, either directly or through downstream infrastructure, was made. The relative line lengths were then used to apportion the costs of this asset class on the assumption that the customers in each tariff class in turn were not supplied from the network.

5.2 Zone and small substations

The avoidable costs of customer tariff classes were estimated as a reduction in the total installed transformer capacity utilised by the tariff class, again with allowance for dedicated substations at 8 major business customer sites.

5.3 High Voltage network

The relative line lengths were also used to apportion the costs of this asset class.

As the proportion of the High Voltage network utilised by major customers is less than 1%, involving a number of short dedicated feeders, the removal of this tariff class would have negligible cost impact.

The remainder of this network used by the 183 High Voltage business tariff class customers and the Low Voltage tariff classes. The avoidable costs for each of these tariff classes were again estimated from the typical configuration of supply from the High Voltage network in metropolitan and rural areas, as the proportion of network that could be removed whilst still providing supply to the remaining tariff classes.

5.4 Distribution substations

The major business and High Voltage business tariff classes do not use this distribution infrastructure.

The avoidable costs associated with single customer distribution substations could readily be estimated directly for the low voltage business (large LV business and small business) and residential customer classes. The same approach could be followed for the proportion of substations supplying only one of these customer classes. For shared distribution substations, the respective capacity shares of the customer classes were used.

5.5 Low Voltage network and services

The major business, High Voltage business and Large LV business tariff classes do not use this distribution infrastructure.

The avoidable costs for each of Low Voltage tariff classes were estimated from the typical configuration of supply from the Low Voltage network in metropolitan and rural areas. In mixed supply areas no reduction in the network was appropriate.

5.6 Summary of Avoidable costs

The avoidable costs of SA Power Networks' four tariff classes, estimated from existing system costs using the approach above are set out both as proportions of the cost pool and in dollar terms in Table 2. As the costs represent reductions, they are negative in sign. The percentage figures represent the avoidable proportion of the total annual costs (cost pool), associated with each level of the network, resulting from the above adjustments to the required equipment and capacity requirements. The percentages, when applied to the cost pool, result in the avoidable costs shown. As with Table 1, the costs have been updated to the forecast 2015/16 revenue of $682 million.

Table 2 - Avoidable costs of tariff classes ($million p.a., 2016/17)

Network level	Cost Pool	Tariff class									
		Major business		HV business		Large LV Business		Small business		LV residential	
Subtransmission	53	*-1%*	-1	*0%*	0	*-3%*	-1	*-3%*	-1	*-2%*	-1
Zone/small substations	97	*-4%*	-4	*-4%*	-4	*-4%*	-3	*-4%*	-3	*-14%*	-14
HV network	179	*0%*	0	*0%*	0	*-4%*	-7	*-4%*	-7	*-22%*	-39
Distribution substations	92	*0%*	0	*0%*	0	*-23%*	-21	*-23%*	-21	*-36%*	-33
LV network and services	202	*0%*	0	*0%*	0	*0%*	0	*-10%*	-19	*-68%*	-138
Non system costs	110	*0%*	0	*0%*	0	*-2%*	-2	*-2%*	-2	*-27%*	-30
Total	**734**		**-5**		**-4**		**-35**		**-54**		**-255**

6 Compliance with Rules clause 6.18.5(a)

In Table 3, the revenue expected to be recovered from each of SA Power Networks' tariff classes in 2016/17 is compared with the stand-alone and avoidable costs calculated in sections 4 and 5.

Table 3 - Stand-alone and avoidable distribution network costs ($M, 2016/17)

Tariff class	Stand-alone cost	Tariff revenue	Avoidable cost
Major business	$91	$10	$5
HV business	$102	$34	$4
Large LV business	$244	$195	$35
Small business	$308	$128	$54
LV residential	$641	$367	$255

SA Power Networks' 2016/17 network tariff classes lie within the subsidy free range, in that the expected DUoS revenue collected from the tariff class lies between the avoidable and stand alone costs of supply and therefore meet the requirements of section 6.18.5(a) of the Rules.