

Attachment Q.2

SAPN_PUBLIC_Overview ACS Modelling



Including:

Appendix 1 - PUBLIC_Meters subject to defect (letter from manufacturer)

Appendix 2 - PUBLIC_SA Power Networks' Equipment/
Standard Bulletin of November 2013

03 July, 2015



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Appendices:

Appendix 1 - Meters subject to defect (letter from manufacturer) - CONFIDENTIAL

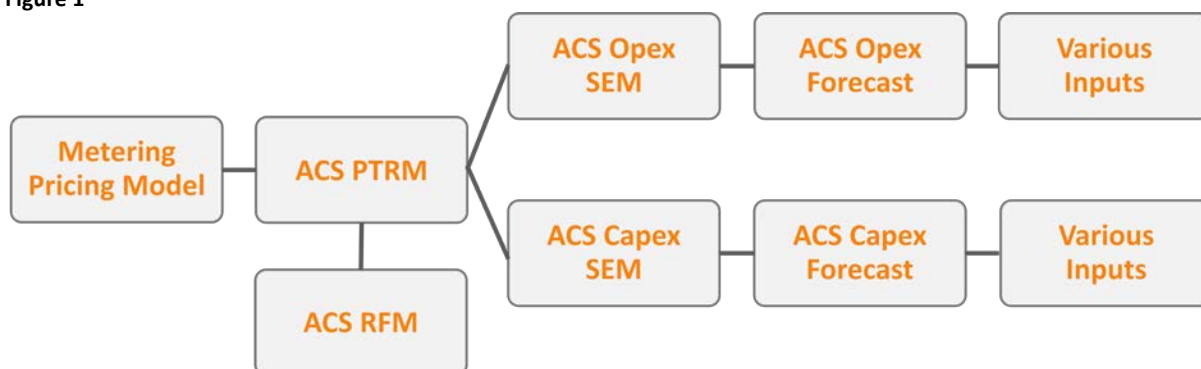
Appendix 2 - SA Power Networks' Equipment/Standards Bulletin of November 2013 - CONFIDENTIAL

Attachment Q.2 – SA Power Networks Overview ACS Modelling

1. Summary

SA Power Networks' Revised Proposal in respect of Alternative Control Services (ACS) is supported by a number of models, which are listed and explained in this attachment. Figure 1 provides a graphic representation of the key relationships between the core models.

Figure 1



The actual relationships are more complex and interconnected than shown above. However, we have tried to keep the links between the various models intact, and would be pleased to assist with re-establishing them should they be broken in the transmission to the AER.

In summary, SA Power Networks' approach was to develop a pricing methodology that allocates forecast metering expenditure and the asset costs related to the Metering Asset Base (MAB) through a Roll Forward Model (RFM) and Post-Tax Revenue Model (PTRM), based on the AER's approach, to generate the annual revenue requirement (ARR) for ACS metering services. Metering prices, reflecting each service's estimated cost to serve, are then set to recover the ARR.

2. Metering pricing model (Attachment Q.8)

The metering pricing model (MPM) shows how the Revised Proposal pricing for annual metering charges and upfront meter installation charges has been calculated.

2.1 Annual metering charges

Annual metering charges for 2015/16 are the same as those set out in the AER's Preliminary Determination (PD) and our Annual Pricing Proposal.

Annual metering charges for 2016/17 have been set by adjusting the PD charges by a price adjustment factor that has been goal-sought to match the net present value (NPV) of the smoothed and unsmoothed revenue requirements using the same method as the AER. The 2016/17 charges are then escalated by CPI and X to determine the charges for the last three years of the Regulatory Control Period (RCP).

The smoothed revenue requirement comes from the *Revenue* table in the MPM *Adjusted for PD* tab. For 2015/16 it applies the PD charges to forecast customer numbers. For the balance of the RCP it applies the Revised Proposal charges (calculated as described above) to the forecast customer numbers.

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The forecast customer numbers reflect our Revised Proposal forecast, adjusted customer growth (for the first two years of the RCP) and churn. Our churn assumptions are set out in Attachment Q.6. Churn has been apportioned evenly over all three ACS annual metering tariff classes, as shown in the *Forecast Customer Numbers* table in the *Assumptions, Volumes* tab.

The unsmoothed revenue requirement comes from the Revised Proposal PTRM (Attachment Q.9), which reflects our Revised Proposal.

2.1.1 Tariff structure of annual metering charges

The *New Tariff Structure* table in the *MPM Adjusted for PD* tab reflects SA Power Networks' proposed tariff structure, which is consistent with the AER's, other than with respect to the treatment of the Benchmark Tax Liability, which we have proposed should form part of the capital component. SA Power Networks' tariff structure allocates 60% of the tariff to the capital component, compared to the AER's PD proportion of 57%.

This structure has been used to disaggregate the 2016/17 charges as can be seen in column D of the *Annual Charges* table on the *MPM Adjusted for PD* tab. As noted above, we have followed the method applied by the AER in the PD.

2.2 Upfront meter installation charges

Upfront meter installation charges for 2015/16 are consistent with the PD and our Annual Pricing Proposal.

Upfront meter installation charges for 2016/17 and for the balance of the RCP reflect SA Power Networks' cost build-up for Type 5 and Type 6 meters, adjusted annually by CPI and X.

The cost build-ups are set out in the *Accumulation Meter Costs* and the *Manually read interval meter costs* tables, on the *Costs* tab. The meter proportions and meter costs reflect those used by the AER in its PD. The tables clearly set out the cost build-up including the overheads as per SA Power Networks' Cost Allocation Method (CAM).

The X factor reflects the input cost escalation proposal used for our Revised Proposal for Standard Control Services (SCS) as well as Alternative Control Services (ACS).

3. ACS Post Tax Revenue Model (Attachment Q.9)

SA Power Networks has applied the AER's Roll Forward Model (RFM) and Post-Tax Revenue Model (PTRM), to generate the annual revenue requirement (ARR) for ACS metering services.

The PTRM takes expenditure forecasts in June 2015 \$ including input cost escalation from the Opex and Capex Submission Expenditure Models (SEMs).

4. ACS Capex and Opex SEMs (Attachments Q.4 and Q.7)

The capex and opex SEMs take expenditure forecasts from the relevant forecast models (Attachments Q.3 and Q.6) in June 2015 \$ and apply input cost escalation.

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5. ACS Opex Forecast (Attachment Q.6)

SA Power Networks' opex forecast model produces operating expenditure forecasts before input cost escalation for four cost categories (Maintenance, Meter reading, Energy data services, and Overheads). These become inputs to the Opex SEM (Attachment Q.7) in June 2015 \$ which applies input cost escalation.

5.1 Outputs to SEM

SA Power Networks has adopted the AER's base step trend (BST) approach to the assessment of opex, with some appropriate modifications.

The BST approach delivers a single opex forecast, which we have disaggregated into the four cost categories by means of the analysis undertaken on the *EB RIN Data* tab.

The expected future proportions of these categories was analysed based on the most recent three years of Economic Benchmarking (EB) RIN data where available and relevant, adjusted to reflect the reclassification of Type 5 meter costs and energy data services (EDS) to ACS from 2015/16 onwards. To be able to make this analysis, the following calculations were performed. The Type 5 costs for 2013/14 were extrapolated from earlier historical cost data. EDS data was back-cast by deflating the value attributed to 2014/15 (the value excised from SCS). The disaggregation is effected in the *Outputs* table on the *Outputs to SEM* tab.

5.2 Base Step Trend

The *BST* tab compares the AER's approach with SA Power Networks' modified approach, which is set out in the *SAPN Approach R.P.* table on the *BST* tab.

5.2.1 Base opex per customer

SA Power Networks has adopted the AER's approach to the calculation of the Raw Base, but has modified the adjustment for Type 5 maintenance to include overheads as noted in our Revised Proposal. (Category analysis (CA) RIN data was used, which excluded overheads.)

The overhead uplift analysis is shown in the *Adjustments to Raw Base* table on the *Workings* tab. Overheads as a proportion of historical opex is based on EB RIN data. This is converted to an uplift factor (i.e. the value to apply to base costs) in the *Convert CA RIN Data to EB RIN style* table in the *Workings* tab.

The pre-EDS adjusted base incorporates appropriately calculated adjustments for Type 5 maintenance. As noted in our Revised Proposal, we have calculated the pre-EDS base opex per customer by averaging the two most recent years as they are far more representative of current cost structures than the earlier years.

The adjustment for EDS costs excised from SCS is based on June 2015 \$ and has been unitised based on 2014/15 customer numbers.

The SA Power Networks base expenditure is the sum of the pre-EDS adjusted base and the EDS cost per customer.

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5.2.2 Step changes

As noted in the Revised Proposal, we have identified step changes (which could equally be considered adjustments to the raw base) in respect of first time CT Testing, for metering contestability, and for the change to new 3-phase accumulation meters, as explained below.

First time CT Testing

Attachment Q.5 lists the installation and first testing date of all CT meters. We have counted those that require testing for the first time during the next RCP, the costs of which are not reflected anywhere in our base opex data. The calculation of a weighted average cost per test has been set out in Attachment 5. This cost has been applied to the annual volumes determined as noted above and reflected on a per customer basis in the *Step* section of the *SAPN Approach R.P.* table on the *BST* tab.

Metering Contestability

We have identified two cost impacts of increasing meter churn and the assessment of these costs are set out in the *Calculate increase in metering opex due to metering contestability (churn)* table in the *Workings* tab.

We have assumed that an extra FTE (admin, grade 4) will be required for additional meter route management for each additional 50,000 (6% of the customer base initially) meter customers lost. The *meter reading route management* section of the *churn* table shows that we offset the impact of churn on these costs by one year. The personnel unit cost is the same as used in respect of the EDS charge excised from SCS.

As customers transition to remotely read meters, meter reading becomes more expensive on a per read basis (less efficient). As noted in our Revised Proposal, we have applied the Smart Grid Smart Cities 'Swiss cheese' model to our expectations of meter transfer, to calculate the impact of these inefficiencies.

The Swiss cheese model simply applies the gradual increase in the average distance travelled between meters to determine an annual rate of change in unit meter reading costs. We have applied this rate of change, again offset by one year, to our calculation of the meter reading component of benchmark opex per customer in the *Impact of inefficiency due to churn (Swiss cheese effect)* section of the *churn* table in the *Workings* tab.

The proportion of the base opex per customer represented by meter reading was calculated by reference to EB RIN data. This gives us the meter reading component of benchmark opex/customer to which the rate of change was applied.

Change to new 3-phase accumulation meters

SA Power Networks must change to a cheaper 3-phase accumulation meter from a new supplier consistent with the cost structure substituted by the AER's Preliminary Determination. The annual operating costs associated with the new programming devices, has been added as a cost per customer.

5.2.3 Trend

SA Power Networks has summed the base opex per customer and step change costs per customer to determine the opex per customer for each year of the next RCP. Consistent with the AER method, we have applied this to customer number forecasts for each year to get the trend in opex per annum.

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SA Power Networks notes that the AER in its analysis used a different basis for customer numbers in its calculation of the raw base and for the trend. This has been noted in our Revised Proposal.

SA Power Networks has used the customer number categories used by the AER for its historical analysis for both our historical analysis and as the basis for our forecast. Refer to the *Volumes* and *Customer Number Detail* tables in the *Volumes* tab.

We have adjusted the forecast for expected churn as set out in the *Meter transfer & other customer loss forecasts* table on the *Volumes* tab. The individual categories are discussed below.

- New customer forecasts are not relevant and are highlighted as such in the table.
- Neither are the majority of other categories in 2015/16 and 2016/17, prior to the Rule change date. Only retailer initiated change is reflected in our churn forecast for these years.
- Reactive replacements are based on the PD approved volumes, adjusted to account for the impact of a planned replacement program not accepted by the AER.
- Corrective replacements are as approved by the AER.
- Voluntary opt in/new business tariff, new solar, and service alteration volumes are as forecast in our Revised Proposal tariff strategy.
- Retailer initiated meter change is based on what retailers have told us they will do, as discussed in our metering contestability attachment (H.8) noted in the Revised Proposal.
- As per the draft metering contestability Rule change, from 1 July 2017 SA Power Networks will no longer be gaining new meter customers. The natural meter customer attrition reflected in our historical data (the difference between new customer connections and net customer number growth) will have an additional impact on our meter customer numbers going forward.

6. ACS Capex Forecast (Attachment Q.3)

SA Power Networks' capex forecast model produces capital expenditure forecasts before input cost escalation for two capex cost categories (Meter replacements, and Information Technology (IT) systems and infrastructure). These become inputs to the Capex SEM (Attachment Q.4) in June 2015 \$, which applies input cost escalation.

6.1 Outputs to SEM

The *Outputs to ACS SEM* table in the *Outputs to SEM* tab summarises the detail provided in the *Capex Detail* table. The *Outputs from SEM to PTRM* table takes the outputs from the ACS Capex SEM, which include input cost escalation. This table is included to facilitate the calculation of the overall variance between the capex approved in the PD to SA Power Networks' Revised Proposal capex. This calculation is shown in the *Revised Proposal Capex* Table.

The *Capex Detail* table in the *Outputs to SEM* tab calculates annual capex for each category based on forecast volumes and costs as relevant. Volume assumptions are set out in the *Volumes* tab. Cost assumptions are shown in the *Costs* tab.

6.2 Volume forecasts

The *Volumes table* in the *Volumes* tab sets out forecast meter replacement and meter IT capex. Meter replacement is not expected to continue past 30 June 2017, but as the metering contestability Rule change has not been finalised at this stage, we have included replacement forecasts to the end of the RCP. The meter IT capex noted in our Revised Proposal is not affected by the metering contestability Rule change, and is therefore relevant to the full RCP.

6.2.1 Meter replacement capex

Corrective Replacement

We have reflected the AER's PD in respect of Corrective replacement capex volumes.

Reactive Replacement

We have also reflected the AER's PD in respect of Reactive replacement capex volumes, but have made an adjustment to reflect the AER's decision to reject our proposal to undertake the planned replacement of catastrophically failing 3-phase electronic meters.

The failure (and therefore replacement) rate of these meters, which are known to be defective, is expected to continue to grow at a very high rate. These meters pass batch field accuracy testing, but our bench testing data shows a dramatic growth in failure as these meters age. We have included advice from the manufacturer acknowledging the issue and identifying the volume of meters subject to the defect, as Appendix 1 to this Attachment. We have also provided SA Power Networks' Equipment/Standards Bulletin of November 2013 reflecting the manufacturer's advice, as Appendix 2 to this Attachment.

The *Reactive – Additional Volumes* table shows the actual failure rates of these meters over the past three years. We have extrapolated the most recent annual growth in failure rate to forecast future failure volumes. The 2014/15 forecast is congruent with field experience so far this year. The later year extrapolations have been dampened to reflect a more conservative outcome. Compounding failures are reflected in the *Failing 3ph elec* chart.

Proactive

As noted in our Revised Proposal, we have proposed the inclusion of a very small allowance to change out one of the Holdfast Shores metering systems, to avoid the risk of complete failure of the metering within any one of the three towers. The proposal would provide spares for the remaining two towers, which are no longer available. The volumes reflected in the *Proactive Volumes* table are the same as proposed for the first year of the replacement program in our Original Proposal.

6.2.2 Meter IT capex

SA Power Networks has proposed IT capex for three purposes:

- To facilitate billing under the new metering tariff classification set out in the PD;
- The ongoing replacement program for meter reading devices; and
- To facilitate the deployment of the new 3-phase accumulation meter substituted in the PD.

New metering tariff

There are no volumes associated with this project. Please refer to the *Costs* tab.

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Replacement of meter reading devices

As noted in our Original Proposal, SA Power Networks replaces the handheld devices used by meter readers every three years, which means 40 units per annum are replaced.

Facilitate new 3-phase accumulation meter

As noted in our Revised Proposal, the AER's decision to substitute the cost of a meter from a new meter provider effectively forces SA Power Networks to change to that supplier to mitigate against future losses. This capex is in respect of the cost of deploying the 60 programming units that will be required to implement the new meter.

6.3 Costs

Replacement capex

The meter costs for both Type 5 and Type 6 meters reflected in SA Power Networks' Revised Proposal reflect:

- The meter procurement costs accepted or substituted by the AER in the PD;
- The percentage cost weighting between single and two element and 3-phase meters accepted by the AER in the PD; and
- The stores/materials on-cost and project support congruent with SA Power Networks' CAM accepted (but inconsistently applied) by the AER in the PD.

These costs are set out and summarised in the two *Meter Costs* tables in the *Costs* tab.

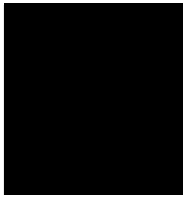
The calculation of the average cost to replace Holdfast Shores meters is set out in the *Proactive Meter Replacement* table in the *Costs* tab.

Meter IT capex

Unit costs for meter reading handheld devices, the hardware and other setup costs for the new 3-phase meter, and the systems upgrade costs to facilitate the new tariff structure, are set out in the *IT Systems & Infrastructure* table in the *Costs* tab.

Detail in respect of the capital costs to change to the new 3-phase meter is shown in the *Change to 'Secure' 3ph Meter* tab.

Detail in respect of the capital costs to facilitate the new billing structure is shown in the *IT – Billing* tab.



David Gordon
Metering Asset Manager
SA Power Networks
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Keswick, SA 5035

12th of June 2014

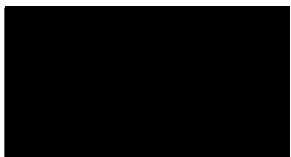
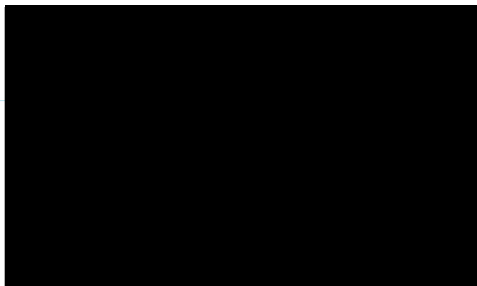
Dear David

RE: Faulty [REDACTED] Meters

We refer to your email dated the 2nd of May regarding post warranty failures experienced by SA Power Networks (SA Power) with the [REDACTED] electricity meters (Products) supplied by [REDACTED] between 2006 and 2008 pursuant to the Letter of Offer from [REDACTED] dated the 14th of June 2006 (Letter). [REDACTED] has accepted to provide certain technical information. This information is attached in Appendix A.

Please advise me if you have any questions related to the information provided. [REDACTED] is committed to supporting SA Power regarding this matter.

Yours faithfully,



APPENDIX A

Please note that except as expressly provided for in the Letter, no term, condition, warranty, representation or covenant of any kind is implied, or has been made or is given by [REDACTED] its employees, officers, representatives, agents or advisors, in respect of or concerning any of the Products or any information provided in respect of the Products. Additionally none of the information provided by [REDACTED] its employees, officers, representatives, agents or advisors, in respect of the Products shall constitute an admission of any liability (whatsoever arising) by [REDACTED]

The test results from all twelve defective meters provided by SA Power Networks for investigations confirm the root cause to be a [REDACTED]

[REDACTED]. The symptom of meter failure due to this issue is a blank display on the meter and the registers stopping, whilst the customer continues to receive electricity.

The premature failure of the [REDACTED] was a known problem in the industry at the time which affected many meter manufacturers. When [REDACTED] became aware of this issue it [REDACTED]. Rest assured that [REDACTED] quality assurance program ensures that components used in all of its products are of the highest quality and reliability.



EQUIPMENT/STANDARDS BULLETIN

To: Managers, Leaders, Employees & Contractors

Date: 15 Nov 2013

Subject: [REDACTED] Phase Whole Current Meter, [REDACTED]

Bulletin no: 57

BACKGROUND

It has been discovered through routine testing that the [REDACTED] three phase whole current meter [REDACTED] may develop a problem with its display leading to difficulty in reading the meter. The manufacturer has advised that this meter is now at or approaching its 'end of life' and should be replaced.

ITEMS AFFECTED

- [REDACTED] three phase meter, model [REDACTED] is now obsolete.
- [REDACTED] now supersedes [REDACTED]

ACTION TAKEN

- An asset replacement plan is proposed, commencing with the first groups of [REDACTED] meters that were installed on the network.
- [REDACTED] meters are to be replaced with [REDACTED] meters if the opportunity arises.
- [REDACTED] are no longer available for use.

ADDITIONAL COMMENT

- Managers/Leaders to discuss details with relevant employees & contractors as soon as practicable.
- Copy of Bulletin to be placed on all notice boards.

Authorised by: Jehad Ali (MNSP)
Bulletin Validity: From: 15 November 2013 To: Until further notice
Contact: Brett Allen (45445) Equipment Engineer

Network Management – Network Standards and Performance