SA Power Networks

Supporting document 5.32

ADMS Business Case

2020-25 Revised Regulatory Proposal

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SA Power Networks

ADMS Business Case

Contents

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Summary

During the 2020-25 regulatory period, support for key components of SA Power Networks' ADMS will be withdrawn by the product vendors. Good electricity industry practice dictates that to manage the risk of cyber security attacks on mission critical assets such as ADMS, vendor support should be current and in place on the systems and platforms.

The ADMS requires four components to function:

1. Hardware,
2. Operating Systems ([redacted])
3. Database Software ([redacted]), and
4. ADMS Software ([redacted] ADMS [redacted])

Each component is duplicated so there is a production ADMS and a development ADMS.

From 2023, vendor support from [redacted] for the database software and Operating Systems will cease. Testing[1] has identified that SA Power Networks current [redacted] ADMS Software is not compatible with newer [redacted] Operating Systems and therefore a change in Operating System necessitates an update to the ADMS Software.

The next refresh of the hardware falls within the 2020-25 period. Aligning the update of all components in parallel delivers efficiencies and results in the lowest NPV of all feasible options.

Therefore, the preferred option for maintaining ADMS capabilities during the 2020-25 regulatory period is to update the operating systems to [redacted] and [redacted] in 2022. The ADMS software will be updated from [redacted] to [redacted] The next scheduled hardware refresh will be aligned with the ADMS software update.

Options considered that were found to be more expensive were to upgrade the [redacted] ADMS Software to [redacted] (not feasible[2]) and to defer the hardware update and instead source an extended support contract.

[1] [redacted] tested the current ADMS [redacted]) on [redacted] and [redacted] and found that it was not compatible.
[2] [redacted] will only provide an upgrade to the current version of the ADMS Software, not superseded versions.

Background

The Advanced Distribution Management System (ADMS) is a software platform that allows the centralised management of SA Power Networks' distribution network by drawing on the network and asset performance monitoring capabilities of network sensors. The ADMS provides for automated outage identification, restoration, and performance optimisation of the network to drive efficiencies that benefit customers through a reliable supply of electricity at an efficient cost.

SA Power Networks uses the [redacted] ADMS built by [redacted]. The ADMS is a complex system involving the ADMS software, operating systems and workstation and server hardware. The currently installed version, [redacted] went live in April 2015. [redacted].

ADMS is a 'mission critical' system that enables SA Power Networks to operate the South Australian electricity network safely and efficiently.

The key challenges with the ADMS is maintaining a secure and effective interface between the key components in an evolving software and hardware technology environment.

The most pertinent challenges for SA Power Networks include:

- The current ADMS is two versions behind the latest version of the ADMS available on the market
- Current operating system and database platforms are approaching end of extended vendor support, introducing cyber security risks
- Current hardware platforms are reaching end of vendor support

The ADMS software is a highly complex piece of critical infrastructure. Unlike many consumer grade software products, an operating system upgrade is not as simple as reinstalling the ADMS on the new operating system. In the case of the current ADMS version used by SA Power Networks, [redacted] Furthermore, the installation of a newer ADMS version on a newer operating system requires thorough regression testing to ensure that all functionality of the current system (including SA Power Networks customisations made to the core software) is retained and produces the same outcomes the business expects.

The identified need

During the 2020-25 regulatory period, support for key components of SA Power Networks' ADMS will be withdrawn by the product vendors.

Critical infrastructure such as the ADMS cannot be allowed to operate on an unsupported platform as this would expose SA Power Networks to an unacceptable level of risk and would potentially be in breach cyber security legislation for critical infrastructure.[3] Electricity networks are classified as critical infrastructure.

Good electricity industry practice dictates that to manage the risk of cyber security attacks on mission critical assets such as ADMS, vendor support should be current and in place on the systems and platforms.

Vendor support

Upgrade pathways and system supportability of the ADMS is dictated to SA Power Networks by the software vendors. SA Power Networks has no ability to influence support decisions made by the vendors.

[3] Such as the Security of Critical Infrastructure Act 2018

[redacted] will not continue to provide support for the [redacted] operating systems and [redacted] software. [redacted] follows a strict policy of removing extended support after the announced date.

The ADMS software vendor, [redacted], have indicated that they will continue to provide support as long as is required by SA Power Networks, but will constrain upgrade pathways. This includes not allowing upgrades to versions that have already been superseded, forcing SA Power Networks to upgrade to the latest version available.

ADMS hardware can be managed independently of the ADMS software and operating systems. However, there are additional costs that will be incurred for regression testing if the hardware is updated separate to the software update cycle.

Timing

The timing of ADMS updates is determined by the vendors of the individual ADMS components. This is primarily [redacted], but the compatibility limitations of [redacted] ADMS software also determines which components require updating.

[redacted] extended support for [redacted] will cease in late 2022 and is the first component of the ADMS that requires updating.

Extended support for [redacted] and [redacted] operating systems, which entails security patches for newly discovered vulnerabilities, will cease in 2023 for both operating systems (January for [redacted] and October for [redacted]). After this time, [redacted] will no longer provide security patches for newly identified vulnerabilities.

Support for the ADMS hardware will end in 2021 and SA Power Networks will require an extended support contract from 2022.

All options being considered by SA Power Networks need to include shifting the ADMS to newer operating systems prior to the end of support for [redacted] in October 2023.

The matrix below shows the support status of each of the ADMS components during the 2020-25 period.

Figure 1: Current ADMS Support Status

Current ADMS Components	2020	2021	2022	2023	2024	2025
[redacted]						
[redacted] Operating System						
[redacted] Database Software						
[redacted] Operating System						
Hardware						

Supported
Extended Support
Not Supported

Options considered

SA Power Networks has considered three options for maintaining the ADMS. As the existing ADMS cannot be supported from 2023 due to the end of extended support for the [redacted] operating system, there is no feasible 'do nothing' option.

The '*do nothing different*' option for the ADMS is to undertake a minimal update where necessary to ensure all components of the ADMS are supported by the respective vendors.

Option 1: Update the operating system. Update to ADMS [redacted] Maintain the hardware with extended support.

Note: [redacted] the vendor for the ADMS software, has stated in writing to SA Power Networks that it does not support updating to superseded versions (such as [redacted] [redacted] upgrade policy is to only support the latest officially released version of the ADMS. This option has been retained for the purposes of providing a counterfactual to the other options considered.

This option will maintain the existing level of capabilities with minimal capability enhancement and capital cost during the 2020-25 regulatory period.

SA Power Networks will update the ADMS software to [redacted] in 2022/23, with some early works taking place in 2021/22 to plan the upgrade and to upgrade the database software from [redacted] to [redacted] (as this component will become unsupported earlier than other components of the ADMS).

SA Power Networks will update the operating systems to [redacted] and [redacted] so that the existing [redacted] installations are removed prior to the withdrawal of extended support on October 10, 2023. Both of these are compatible with the [redacted] ADMS [redacted] software.

As some of the customisations applied by SA Power Networks to the ADMS are not available as standard features in [redacted] costs will be incurred to rebuild these customisations on [redacted]

SA Power Networks will continue to operate the ADMS on the existing hardware infrastructure. To enable this, SA Power Networks will purchase an extended support contract in 2020/21 (prior to the end of existing support during calendar year 2022). Based on previous extended support contracts purchased by SA Power Networks for ADMS hardware this will cost $[redacted]

The [redacted] of the ADMS software only works on [redacted] whereas the [redacted] utilises [redacted] Due to this, the ADMS will require its next update sooner than if [redacted] was installed. Mainstream support for [redacted] ends on January 11, 2022, after which paid extended support will be available until January 12, 2027. Therefore, under this option the ADMS will be next updated at the start of the 2025-2030 regulatory period, with the update completed during late 2026.

During the 2025-2030 regulatory period, SA Power Networks will update the ADMS software, operating systems and hardware. These updates will occur together during 2025/26. The full update will need to be compressed into 18 months rather than the preferred two year timeframe to ensure that the operating system is no longer used after January 12, 2027. It is unclear whether this will be feasible and SA Power Networks may need to begin early update works during the 2020-25 period. As the ADMS update will coincide with the hardware update, no additional regression testing will be required.

SA Power Networks has assumed that the cost of both the hardware and software components of the 2026 update will be the same as the cost incurred if updated to [redacted] during the 2020-25 regulatory period (Option 3). This is a conservative estimate as IT update costs generally increase over time. The only other capex costs incurred during the 2025-2030 regulatory period will be annual hardware costs.

The matrix below shows the support status of each of the ADMS components during the 2020-25 period if this option is selected.

Figure 2: ADMS Support Status (Option 1)

ADMS Components (& upgrade version)	2020	2021	2022	2023	2024	2025
[redacted]				*		
[redacted]				*		
[redacted]			*			
[redacted]				*		
Hardware		**				

	Supported
	Extended Support
	Not Supported
*	Commence Replacement
**	Purchase extended support contract

Estimated costs

CAPEX

The estimated capital cost to implement option 1 is $[redacted] over the 2020-25 RCP ($2020), as shown in the table below and the explanatory notes that follow.

CAPEX ($'000, $2017, inc. overheads)

Work package	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Note
ADMS Software											
Software upgrade cost from [redacted]			[redacted]			[redacted]	[redacted]				*(1)*
SAPN Direct Software upgrade support cost		[redacted]	[redacted]			[redacted]	[redacted]				*(2)*
Customisation rebuild cost			[redacted]								*(3)*
Hardware											
Hardware costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	*(4)*
Extended support contract	[redacted]										*(5)*
Totals ($2017, inc. overheads)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Totals ($2020)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	*(6)*

Notes:

1. Quoted price from [redacted]. Additional update prior to withdrawal of extended support for the underlying operating system at same cost spread over 18 months (2025/26 and 2026/27).
2. Estimate based on historical update costs. Includes minor costs associated with installing the new operating systems on the hardware and updating the database software (licence fees are incurred as opex so not shown here). Additional update prior to withdrawal of extended support for the underlying operating system at same cost spread over 18 months (2025/26 and 2026/27).
3. Based on customisation costs for [redacted]

4. Vendor price deferred until 2025/26 with no escalation
5. Estimate based on most recent extended support contract cost
6. All input cost estimates in this business case are in $2017 and include business overheads. The equivalent costs in $2020 (as included in our Regulatory Proposal) are also shown.

OPEX

SA Power Networks is not forecasting any change in existing opex costs.

Cost estimation methodology

Software, hardware and external services costs are provided by the vendor. Internal and overhead costs are estimated using SA Power Networks' standard approach.

Option 2: Update the operating system. Update to ADMS [redacted] Maintain the hardware with extended support.

This option is identical to Option 3 (see below for detailed description) except the ADMS hardware will not be refreshed at the same time as the software update.

SA Power Networks will purchase a five year extended support contract for the ADMS hardware to enable the hardware to be retained for the duration of the 2020-25 RCP. The hardware will be refreshed in 25/26 when the extended support expires. As the hardware refresh will not coincide with a software update additional regression testing that is usually incorporated into the software update cost will be required.

The matrix below shows the support status of each of the ADMS components during the 2020-25 period if this option is selected.

Figure 3: ADMS Support Status (Option 2)

ADMS Components (& upgrade version)	2020	2021	2022	2023	2024	2025
[redacted]				*		
[redacted]				*		
[redacted]			*			
[redacted]				*		
Hardware		**				

	Supported
	Extended Support
	Not Supported
*	Commence Replacement
**	Purchase extended support contract

Estimated costs

CAPEX

The estimated capital cost to implement option 2 is [redacted] over the 2020-25 RCP ($2020), as shown in the table below and the explanatory notes that follow.

CAPEX ($'000, $2017, inc. overheads)

Work package	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Note
ADMS Software											
Software upgrade cost from [redacted]			[redacted]					[redacted]			*(1)*
SAPN Direct Software upgrade support cost		[redacted]	[redacted]				[redacted]	[redacted]			*(2)*
Regression testing						[redacted]					*(3)*
Hardware											
Hardware costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	*(4)*
Extended support contract	[redacted]										*(5)*
Totals ($2017, inc. overheads)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Totals ($2020)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	*(6)*

Notes:

1. Quoted price from [redacted]. Additional update prior to withdrawal of extended support for the underlying operating system at same cost.
2. Estimate based on historical update costs. Includes minor costs associated with installing the new operating systems on the hardware and updating the database software (licence fees are incurred as opex so not shown here). Additional update prior to withdrawal of extended support for the underlying operating system at same cost.
3. Estimate provided by SMEs
4. Vendor price deferred until 2025/26 with no escalation
5. Estimate based on most recent extended support contract cost
6. All input cost estimates in this business case are in $2017 and include business overheads. The equivalent costs in $2020 (as included in our Regulatory Proposal) are also shown.

OPEX

SA Power Networks is not forecasting any change in existing opex costs.

Cost estimation methodology

Software, hardware and external services costs are provided by the vendor. Internal and overhead costs are estimated using SA Power Networks' standard approach.

Option 3: Update the operating system. Update to ADMS [redacted]. Refresh the hardware.

This option will maintain the existing level of capabilities while future proofing the ADMS by ensuring all components of the ADMS are on the most recent compatible releases following the update. The [redacted] ADMS software will be updated from the current [redacted] to [redacted] and the [redacted] and [redacted] operating systems will be updated to [redacted] and [redacted] respectively.

SA Power Networks will update the ADMS software to [redacted] in 2022/23, with some early works taking place in 2021/22 to plan the upgrade and to upgrade the database software from [redacted] to [redacted] (as this component will become unsupported earlier than other components of the ADMS).

SA Power Networks will update the operating systems to [redacted] and [redacted] so that the existing [redacted] installations are removed prior to the withdrawal of extended support on October 10, 2023. Both of these are compatible with the [redacted] ADMS [redacted] software.

SA Power Networks will coincide the next hardware refresh with the [redacted] operating system and database software and [redacted] ADMS software updates. This will simplify the update process as the new ADMS version can be installed and tested on the new hardware while the current ADMS continues to operate on the existing hardware. This provides a backup so that if issues occur that delay the update the existing ADMS can continue to be used. Aligning the hardware update will also remove the need for additional regression testing when the hardware update would otherwise be required.

This option will ensure longer term supportability of the ADMS by the respective vendors, which will reduce total lifecycle cost over the next two regulatory periods.

Most of the customisations SA Power Networks has applied to the ADMS are available as standard features on [redacted] This will simplify the update process as SA Power Networks will not need to rebuild the customisations and regression test them on the new ADMS. This contributes to a lower update cost for [redacted] compared to [redacted].

The [redacted] software runs on [redacted]. Mainstream support is available until January 9, 2024 and extended support is available until January 9, 2029. It is not yet known whether this version of the ADMS software will be supported on future versions of [redacted], but based on historical trends SA Power Networks expects future operating systems will not be supported. Therefore, SA Power Networks expects the next update of the ADMS software will be required during 2027 and 2028.

The matrix below shows the support status of each of the ADMS components during the 2020-25 period if this option is selected.

Figure 4: ADMS Support Status (Option 3)

ADMS Components (& upgrade version)	2020	2021	2022	2023	2024	2025
[redacted]				*		
[redacted]				*		
[redacted]			*			
[redacted]				*		
Hardware			*			

	Supported
	Extended Support
	Not Supported
*	Commence Replacement

Estimated costs

CAPEX

The estimated capital cost to implement option 3 is $[redacted] million over the 2020-25 RCP ($2020), as shown in the table below and the explanatory notes that follow.

CAPEX ($'000, $2017, inc. overheads)

Work package	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Note
ADMS Software											
Software upgrade cost from [redacted]			[redacted]					[redacted]			*(1)*
SAPN Direct Software upgrade support cost		[redacted]	[redacted]				[redacted]	[redacted]			*(2)*
Hardware											
Hardware costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	*(3)*
Totals ($2017, inc. overheads)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Totals ($2020)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	*(4)*

Notes:

1. Quoted price from [redacted]. Additional update prior to withdrawal of extended support for the underlying operating system at same cost.
2. Estimate based on historical update costs. Includes minor costs associated with installing the new operating systems on the hardware and updating the database software (licence fees are incurred as opex so not shown here). Additional update prior to withdrawal of extended support for the underlying operating system at same cost.
3. Vendor price
4. All input cost estimates in this business case are in $2017 and include business overheads. The equivalent costs in $2020 (as included in our Regulatory Proposal) are also shown.

OPEX

SA Power Networks is not forecasting any change in existing opex costs.

Cost estimation methodology

Software, hardware and external services costs are provided by the vendor. Internal and overhead costs are estimated using SA Power Networks' standard approach.

Other options that were identified but rejected during initial investigations

The following options were identified by SA Power Networks but not considered in detail due to having critical flaws.

Continue to utilise the existing ADMS software and platform after vendor support is withdrawn

This option has been rejected because continuing to use the [redacted] operating systems after vendor support is withdrawn has an unacceptable level of cyber security risk for a mission critical system and is not in keeping with good electricity industry practice.

Replace the ADMS with a product from an alternative vendor

This option has been rejected because the cost would be very high due to the need to establish a new system from scratch and retrain all staff. There are no known benefits that an alternative vendor could provide to SA Power Networks that could justify the additional expense.

Cease to use an ADMS and fall back to manual processes

This option has been rejected because the ADMS has resulted in significant business efficiencies. SA Power Networks would require a large increase in operating and capital expenditure to maintain current service levels without an ADMS.

The ADMS is embedded into many systems and business processes so calculating the additional expenditure required operate the network without the ADMS would be a significant undertaking. Therefore, this option has not been considered for further investigation.

Comparison of options

Cost/benefit analysis

SA Power Networks has considered three options to maintain the existing ADMS capabilities that the network depends on. As an ICT update, the project is comparable to a replacement project for network assets. The cost/benefit analysis therefore considers which option has the least negative NPV.

NPV ($'000)[4]

Option	NPV to 2030
Option 1: Update the operating system. Update to ADMS [redacted]. Maintain the hardware with extended support.	-19,038
Option 2: Update the operating system. Update to ADMS [redacted]. Maintain the hardware with extended support.	-18,473
Option 3: Update the operating system. Update to ADMS [redacted]. Refresh the hardware.	-17,387

Option 3 has the least negative NPV of the options considered. SA Power Networks proposes to proceed with Option 3.

The following section describes how these benefits are calculated.

Quantified benefits

The driver for the update of the ADMS is to maintain existing capabilities. SA Power Networks does not expect to derive any benefits from the update that can be quantified. The comparison of options is based on maintaining existing capabilities at the least cost.

Non-quantified benefits

The updated ADMS software may include minor capability enhancements. However, these are not expected to be material and are not the basis for the update project. As per AER feedback on the proposed ICT Expenditure Assessment Review[5], minor productivity benefits from software version updates contribute to the annual 0.5% opex productivity target for networks.

Sensitivity analysis

No relevant sensitivity scenarios were identified for this business case. The supporting NPV analysis does not include economic benefits that may have uncertain values requiring sensitivity testing. Cost sensitivity would apply equally to the alternative options and therefore not affect the ranking of the options.

[4] NPV was calculated using the AER Draft Determination real Vanilla WACC. All values discounted to 2019/20 and are in 2019/20 dollars.
[5] https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/ict-expenditure-assessment-review

Recommended option

The preferred option is *Option 3: Update the operating system and shift to* [redacted]*. Refresh the hardware at the same time to take advantage of available efficiencies.*

This option will maintain the existing ADMS capabilities at the lowest total lifecycle cost. This is because:

- Aligning software and hardware updates reduces the total regression testing costs
- Some customised features used by SA Power Networks come as standard in [redacted] but not in [redacted] If the ADMS is updated to [redacted] these customisations would have to be rebuilt and tested.
- [redacted] ADMS software [redacted] will not require updating until 2028, whereas [redacted] will require updating in 2026 as this version is only compatible with an earlier version of the [redacted] operating system

[redacted] of the [redacted] ADMS software has some minor capability enhancements over [redacted] and can be extended through the purchase of add-on modules. However, the benefits of the in-built capability enhancements are small or difficult to quantify and SA Power Networks does not intend to purchase additional modules. Any future investment in add-on modules would be dependent on a stand-alone cost benefit analysis prepared at that time.

The preferred option requires ADMS capex of $[redacted] million over the 2020-25 RCP ($2020). This option also includes the hardware capex component.

Customer and stakeholder engagement

We have undertaken a comprehensive stakeholder engagement program for our 2020-25 Original and Revised Proposals, involving thousands of participants across hundreds of workshops and other activities around the state.

In preparing our 2020-25 Revised Proposal, the ADMS update project was discussed at a Focussed Conversation held on Monday 21 October with members of the SAPN Customer Consultative Panel (SAPN CCP) and other stakeholders, and it was again discussed during Field Trips held on Monday 28 October and Monday 11 November. Throughout these engagement activities, our stakeholders understood and supported the need to update the ADMS, and acknowledged the importance of IT systems in driving productivity improvements and delivering better customer outcomes.

Alignment with our asset management objectives

The ADMS is critical to the safe and reliable operation of SA Power Networks' electricity distribution network. Operating the ADMS on unsupported software, operating systems or hardware platforms exposes the business to an unacceptable cyber security risk.

SA Power Networks is adopting the Australian Signals Directorate's (ASD) Essential 8 recommendations in addition to elements of the cybersecurity standards developed by the US National Institute of Standards and Technology (NIST) Cybersecurity Framework (CSF).

The Essential 8 recommendations require busiensses to ensure that all critical softwaare systems are maintained on supported versions and are regularly patched.

The NIST Cybersecurity Framework is a global standard for cybersecurity and protection of critical infrastructure. It has five core objectives:

- **Identify**: assessing the threats and risks to systems and understand the vulnerabilities
- **Protect**: defending systems from attack with best practice approaches
- **Detect**: having tools and protocols in place to spot when a breach has happened
- **Respond**: reacting quickly using automated safeguards to contain the breach and have protocols in place to mobilise resources
- **Recover**: having plans in place to handle the aftermath, communicate the outcomes and review the learnings.

To meet these objectives software systems must be maintained on supported versions. Unsupported and unpatched software does not meet the requirements for protection and may reduce the ability for a business to detect and respond to a cyber attack.