evoenergy

Appendix 1.24: Business Case for ADMS Enhancements

Regulatory proposal for the ACT electricity distribution network 2024–29

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1. Background to the Project

1.1. Increasing Energy Demand and DER in the ACT

There are currently multiple ACT and Federal government initiatives that will create increasing energy demand within the ACT over the medium term, as well as a projected rising level of DER. Examples of the key initiatives and aspirations driving this growth are:

- ACT's Pathway to Electrification[1] – The ACT Government plan to electrify Canberra and transition away from fossil fuel gas by 2045. This includes an expectation that in 2023 regulation to prevent new gas connections will commence.
- Ban on new Internal Combustion Engine (ICE) vehicles from 2035 (likely to stimulate the demand for Electric Vehicles (EVs) before this point, with the consequential need for additional charging capacity)
- Home Energy Support Program with rebates for efficient electric appliances (e.g., heat pumps or reverse cycle Air Conditioners) and solar panels for low-income households
- Loans from the Sustainable Household Scheme for energy efficient products, rooftop solar, hot water heat pumps, EV chargers, EV and battery storage. In 12 months, the scheme supported almost 24 MW of rooftop solar and 1,294 household batteries
- ACT Government commitment to delivering a Big Canberra Battery of at least 250 MWs of 'large-scale' battery storage distributed across the ACT
- Next Gen Energy Storage Program – Rebates for eligible homes and businesses within the ACT to purchase a battery.

These initiatives are in addition to global cost developments that are likely to increase the individual consumers' economic justification for Solar and batteries.

This combination of factors will result in a continued increase in the amount of small-scale DER, including battery storage, wishing to connect to Evoenergy's network. Given the ACT's net zero aspirations by 2045 the Territory is keen to avoid hosting limits restricting solar and to facilitate customer connections and ensure they can operate as much as possible.

1.2. Challenges for Evoenergy

The increase in demand and growth in DER will create several network issues including:

- Need for augmentation for DER (or applying constraints on generation)
- Increasing quality of supply issues on the network
- Increased requirement for load growth augmentation

The emergence of community and larger batteries also creates opportunities for non-network solutions. In some cases, these opportunities can be exploited with the existing ADMS, but enhancements may offer the potential to do this more efficiently. Other scenarios will require the ADMS enhancements to mitigate the challenges being faced.

1.3. Overview of Options

Full investigation of the magnitude of the challenges and opportunities requires the DER Integration Strategy for Evoenergy, which is being produced this financial year. This business case is restricted to small investments in ADMS enhancements which will deliver benefits in the short to medium term

[1] ACT Government – Powering Canberra – Our Pathway to Electrification, ACT Government Position Paper, August 2022.

to mitigate some of the challenges. These enhancements are likely to be required as key elements of the DER Integration Strategy and will be foundational for many other initiatives.

The 3 options considered were:

1) **Business As Usual** – No ADMS investment but use of traditional solutions to deal with augmentation and Quality of Supply issues. This is the comparison baseline for the other options

2) **Enhanced ADMS Tools in Year 1 of the regulatory period**. This is a combination of:

    [redacted]

    This combination of tools can be used to manage some of the load growth on the network, minimising its impact, and reduce the resourcing required in forecasting and management of DER.

3) **Demand forecasting, scheduling tools and constraint management outside the ADMS.** - These would be implemented as an alternative to the enhanced ADMS tools and would need to be interfaced to the ADMS or operate independently – a manual process. These would also be implemented in Year 1 of the regulatory period and is intended to provide the same functionality as the ADMS enhancements.

Additional details on these options are outlined in Section 2.

1.4. Business Case Approach

This business case has considered costs and benefits over 2 regulatory periods as the enhancements should be operational for at least this period of time. The main costs for the project enhancements are applied in the first year of the regulatory period when the enhancement will be implemented as a suite of improvements. Benefits are expected to be available after these enhancements have been implemented in the model from year 2.

The NPV calculations have used a real discount rate of 2.45%. Sensitivity analysis has been applied to the key inputs to consider the variability of the potential outcomes.

2. Overview of Options

2.1. Option 1 – Business as Usual Operations

This option is to continue using the current ADMS tools and planning solution for forecasting and control. These tools will allow the continued use of non-network solutions for deferral of ZSS upgrades, but requires manual processes to be applied for forecasting of increased DER. Without the additional ADMS enhancements, such as constraint management, the ADMS would not allow for deferred augmentation at the Substation level or for management of non-network solutions for quality of supply improvements.

There is no additional capex involved in this option and this is used as the baseline against which other options are assessed.

2.2. Option 2 – Enhanced ADMS Tools

This option involves implementing a set of ADMS Enhancements that will assist with management of the increasing levels of PV, EVs and Batteries on the network. The relevant modules are already owned by Evoenergy but have not yet been implemented. These enhancements consist of:

- [redacted]

  [redacted]

[redacted]

[redacted]

[redacted]

2 [Project Converge - Evoenergy]

[redacted]

The aim of this Enhancement is to integrate the investment made and capability developed in Project Converge into the ADMS. This should facilitate its use in real time by the control room and other ADMS users within Evoenergy. The project does not include the integration to additional customer owned solar and battery systems and this will need to be assessed separately.

The projected capex costs for these options are as follows:

- Year 1 - $2.75m – Cost for implementation of the enhancements identified above.
- Years 2 – 4 - $100k per annum – Cost for minor on-going enhancement to delivered project

The total Capex is $3.05m. This is split between ADMS vendor Costs, which are 70% of the total with the remaining 30% being Evoenergy resources for implementation effort.

There is no incremental opex.

2.3. Option 3 – Enhancements Outside the ADMS

This option involves taking alternative standalone forecasting and other solutions and integrating back to the ADMS. It may still require the interface between the ADMS and Project Converge.

The benefits are expected to be similar to the ADMS, however the cost will be greater as integrating the standalone solutions is likely to be more expensive than adding modules to the ADMS. There will be additional complexity in integrating them to the ADMS and this integration is essential if the functionality is to be adopted by the control room operators. Additionally, the constraint management tools need to process near real time information on the network and this may not be possible outside the ADMS.

Given the additional cost and complexity for this option and the absence of any incremental benefits identified this will have a lower NPV than Option 2. The business case has therefore not quantified the NPV of this option.

3. Quantified Project Benefits

Evoenergy is still in the process of developing their DER Integration Strategy. This will provide more definitive information on DER Penetration, Hosting Capacity, QoS Issues and Capex/Augex plans to mitigate these issues and allow the selection of a suite of options to overcome the issues.

The actions being proposed in this business case are low materiality foundational investments that will be needed regardless of the other solutions such as tariffs that may be adopted for DER challenges. A conservative approach to quantifying some of these benefits using these investments is assessed in this section. These quantified benefits were sufficient to generate a positive business for the ADMS enhancements and no further attempt has therefore been made to quantify the additional benefits which require the DER Integration Strategy. These additional benefits are described in Section 4.

The benefits considered for ADMS Enhancement are compared against the BAU option that has no additional investment in the ADMS. The quantified benefits break down into:

- Reduced Cost of Operation of Batteries that avoid Augmentation at ZSS
- Reduced Cost of Planning, Forecasting and Interfacing Requirement for Operating with Batteries and DER
- Avoided Quality of Supply Investments

3.1. Reduced Cost of Operation of ZSS Batteries that Avoid Augmentation

3.1.1. BAU Operation

Evoenergy is already using batteries to defer augmentation as demonstrated at the Molonglo ZSS, where the RIT-D process selected the battery option to allow deferment of the ZSS augmentation[3].

Despite a positive business case, the Molonglo RIT-D assessment explicitly noted (as detailed below) that the expected annual battery payment was conservative and could be improved by better forecasting. The RIT-D report notes that battery services were expected to be procured for each event where the forecasted load is within 2 MW of the thermal constraint and highlighted that Evoenergy's forecasting systems were not sophisticated enough to accurately forecast within 2MW. The expected cost also included a 2 hour buffer period before and after each event.

Figure 3 Excerpt from RIT-D report for Molonglo

> The total project cost of this recommended option for Evoenergy is estimated to be $27.8M in present value terms. This includes the $415k in operational expenditure in present value terms in the form of payments to the BESS provider for the first two years, after which the temporary MOSS is established.
>
> While the cost of the option is equivalent to the network option in present value terms, Evoenergy is likely to be able to reduce the actual cost of this option by improvement of its forecasting system to more accurately identify the periods for which the battery will be required. The assumptions used for this RIT-D are conservative

3.1.2. Improvements from ADMS Enhancements

Whilst the option for deferring augmentation at a ZSS is already being achieved, the ADMS tools will mean that Evoenergy can improve their forecasting and scheduling of when the battery is required and reduce Evoenergy's costs (payments to the battery operator). This will then allow the battery operator to optimise the use the battery for the provision of other services.

[3] Evoenergy, Final Project Assessment Report for Molonglo RIT-D Project.

The improvement is based on reducing the expected payments made to battery operators from the improved forecasting covering:

- **Increased Notice Period** – Reviewing the contract for the battery operator indicates that the costs for scheduling the battery increase significantly (by up to a factor of 10) with reduced notice. As an example, the cost reduces from $1,250 for 15 minutes for 1 to 3 hours notice, compared to $375 for 15 minutes given 12-24 hours notice. The ADMS Enhancements should provide improved forecasting of the constraints and therefore longer notice periods.

- **Reduced Buffer Time Period** – A 2 hour buffer period was assumed in the RIT-D when scheduling the battery. The ADMS Enhancements will improve the forecasts and allow Evoenergy to reduce the required buffer period. This should therefore reduce the numbers of hours for which the battery is scheduled.

- **Reduced MW Buffer –** The battery currently needs to be scheduled when the forecast load is within 2 MW of the thermal constraint, reflecting the accuracy of the current forecasting tools. The improved forecasting tools will allow this buffer to be reduced and therefore again lower the number of hours for which the battery needs to be scheduled.

3.1.3. Quantification of the Benefit

Given the expected demand growth, the batteries can only defer growth for a short period (2-3 years), but it is anticipated that there will be an on-going set of ZSS that need to be upgraded in the medium term. Evoenergy expect that Gold Creek, Belconnen, Woden, Wanniassa and Latham ZSS will all need upgrading in the next 2 regulatory periods and that batteries can be used to defer these as they all have space available for batteries.

The business case assumption is therefore that there would be an average of 1 live ZSS deferral project each year where the ADMS tools would reduce the scheduling of batteries and therefore the payments that need to be made to battery operator. No benefit has been claimed for the potential for better forecasting to extend the time for which deferral of the augmentation could continue.

The current forecast annual payment to the battery operator over a 2 year period is $208k per annum. It is expected that the combination of reductions in scheduling and improvement in notice period identified above will reduce this cost by 33%. This results in an annual benefit of $69k per annum commencing from year 2 of the regulatory period.

3.2. Forecasting and Control Requirements for Operating with DER

3.2.1. BAU Operation

Batteries are already developing at a rapid rate in the ACT. Alongside the Molonglo battery there are plans for 4 community batteries with 3 supported by the federal government and 1 by the ACT government. These will all have an opportunity for demand management contracts and Evoenergy is also already exploring an opportunity with the existing third party battery at Elvin. These management contracts may assist with both capacity issue and quality of supply issues that are expected on the network. In addition to the community batteries there is an expectation that customer batteries could be accessed as part of a VPP that would increase the potential benefits of the ADMS Tools. This level of battery penetration is expected to continue to grow throughout the next 2 regulatory periods.

Compounding the forecasting challenges of the emergence of batteries is the continuing growth of Solar. This will be driven by higher wholesale prices, increased demand (EVs and gas transition including heating load) and ACT policies on DER described in section 1.1. This will build on strong growth that has already occurred in the current regulatory period.

The growth of DER (including larger batteries) on the network will create increased demand for forecasting, monitoring and control impacting the control room and planning departments. This activity will be required to ensure that the network remains within operational limits and that the impacts of DER are properly understood and managed. The key activities include:

- **Control Room Requirement** – The control room will be responsible for the monitoring and control of batteries and larger PV. The typical interactions will include:
    - Initial Scheduling of the battery based on forecast demand and battery availability (Considering commercial and technical implications of scheduling)
    - Updating scheduling nearer the time reflecting changing circumstances
    - Monitoring of batteries and solar against operating instructions and taking action where operating outside agreed levels
    - Providing confirmation of compliance against operating instructions

With the increasing number of batteries, it will not be practical for control room operators to manually do this within their current roles without adding additional personnel. Even with one additional person it will create challenges to operate when this person is unavailable either through being not on shift or on leave.

- **Planning Requirement** – There is an expected increase in the forecasting load for the planning team from a combination of:
    - Considerable manual manipulation of historical load and weather data to define forecasts for near and long term operating conditions (this is a key feature of the proposed forecast tools)
    - Planning assessments for:
        - New ZSS Batteries (and their ability to defer augmentation)
        - Increased Community Battery implementation (and augmentation impact)
        - VPPs from Aggregators
        - Larger quantities of DER impacting augmentation requirements
        - Assessment of changing demand with combination of EVs, PVs and batteries

Forecasting the network impact of DER and batteries is needed for both near term and long term forecasting. It would include the requirement to create DOEs for battery and larger solar solutions to reflect the network state and avoid augmentation for marginal benefit.

3.2.2. Improvement from ADMS Enhancements

The enhanced ADMS tools would automate these tasks to avoid the costs of additional resources. The control room is a key user of the ADMS and would apply the forecasting, constraint management and DOE modules to largely automate the decision making process for scheduling of batteries and monitoring of DER. The planning team would utilise the ADMS data processing enhancements and new features, particularly forecasting and DOEs, to make their planning assessments. This would allow the additional resourcing to be avoided as the additional tasks can be performed more efficiently.

3.2.3. Quantification of the Benefit

The BAU expectation is that the increased requirement will result in an additional control room resource and planning resource by the end of the next regulatory period. As the timing of these additions is uncertain this has been modelled as a linear increase over the 5-year period increasing from 0.2 FTEs in 2024-25 to a steady state of 1FTE from 2028-29

The costs of the FTEs are based on:

- Control Room Resources – FTE Cost of [redacted]
- Planning Forecasting Resources – FTE Cost of [redacted]

The ADMS Enhancements will avoid the need for these additional resources as the task can be performed more efficiently. This results in an annual benefit starting at $0[redacted]m in Year 2 of the regulatory period and gradually increasing to $0.[redacted]m in year 5 and beyond of the regulatory period.

3.3. Avoided Quality of Supply Investments

3.3.1. BAU Operation

The increasing level of DER is already causing Quality of Supply issues on Evoenergy's network with Power Factor dropping below acceptable levels and voltage issues also emerging on the network. These problems are likely to worsen with increasing amount of DER and will require Evoenergy to take action to mitigate these network issues.

The BAU response is for reactive plant to be installed at the ZSS that have the most extreme issues. This investment has been avoided until the 24-29 regulatory period, but action is expected to become essential in this timeframe given increasing power quality issues.

3.3.2. Improvements from ADMS Enhancements

An alternative way to resolve power quality issues will be to utilise the batteries that are installed on the network. The poor power factor could be mitigated by having a battery able to charge and absorb the excess generation during times of peak generation. Whilst Evoenergy would pay for the operation of the batteries where it was assisting with power quality, they are assumed to be installed and financed by battery operators. This additional revenue stream and ACT Government support should help locate batteries in suitable locations.

The use of batteries to avoid reactive plant requires an enhanced understanding of the operation of the network. This includes analysis of the timing of when DER is causing (or likely to be causing) power quality issues on the network and what constraints may exist to management of the issues. The operators need to have an understanding of the state of the batteries to ensure they can be charged appropriately to mitigate the issue and to efficiently provide scheduling instructions and monitor for compliance. They also need to avoid any constraints or breaching of DOEs. This would not be possible with the current functionality of the ADMS.

There are different options for the batteries that could be scheduled using the ADMS Enhancements including:

- Community batteries potentially at areas where poor power factor exists
- VPPs with control focussed on areas where poor power factor exists
- ZSS batteries (such as the Molonglo battery)

The ideal scenario may be that several small-scale batteries on different feeders are needed to resolve the power factor problems at a ZSS. This would resolve the power factor near to the power quality issue, which may be the optimal solution. However, if these batteries were not available it may be possible to correct the power factor using a battery at the ZSS. Either of these options could be facilitated using the ADMS enhancements.

3.3.3. Quantification of the Benefit

This assessment has Quality of Supply benefits based on an avoided set of reactive plant at a ZSS. These are assumed to be required at two ZSS in year 3 of the 10-year assessment period. The reactive plant are assumed to cost $0.5m each with 2 required at each ZSS. This is the avoided cost benefit the ADMS Enhancements will enable.

The benefit should be offset by payments to battery operators. These are assumed to be low as they will reflect a requirement to charge during periods of excess solar, which would reflect normal operation for the battery operator as wholesale energy prices are likely to be low. An example of network revenue was considered in Ausgrid's Community Battery Feasibility Study Report[4]. In this assessment of a community battery, they assumed the battery operator's revenue would be the quarterly annuity value equivalent to the estimated transformer Capex over the assets 45 year life. This was a relatively small proportion of the revenue stack (4%) at less than $3k per annum for a 500kWh battery.

The ARENA cost benefit analysis[5] of Community Batteries also shows a similar low level of expected network revenue from network demand management. This was based on the value of curtailed energy and the DUoS cost. Whilst neither assessment has specifically considered the value of power quality services, both reports indicates that network revenue is not a critical component of the business cases for battery operators. The assessment therefore assumes an offset payment to several community size battery of $20k per avoided set of reactive plant per annum. This level of payment would also be applicable for a VPP or a ZSS battery if they were used instead of community batteries.

The BAU solution would have commissioned reactive plant that will continue to have value beyond the end of the assessment period with an expected life of 25 years applied. Two options were considered to account for the relative value of the BAU solution compared to the ADMS Enhancements. These were:

- Remaining depreciated value of the reactive plant at year 10 of the modelling
- NPV of the value of the required payments to battery operators until the end of expected the life of the reactive plant

The business case for the ADMS enhancements is focused on the incremental costs and benefits compared to BAU. As the incremental cost is the on-going payment to the battery operators this option has been selected. This aligns with the expectation that the batteries will continue to provide the power quality service beyond the life of the model (even if they are replaced at some point). There is also a possibility that improvements in DER reduce the need for the service as older PV is replaced and that the payments could reduce over time. Whilst not captured in the model this option is an additional potential qualitative benefit.

The net benefit of this option is therefore comprised of the following:

- Avoided cost of reactive plant in Year 3 of the model - $2m;

minus

- Annual payments to Battery Operators of $20k per ZSS equal to $40k per annum for 8 years; and
- Value of the payments still required for the expected life of the reactive plant – This is an additional 17 years at $40k per annum

[4] KPMG, Ausgrid Community Battery Feasibility Study Report, A report of Ausgrid Operator Partnership, Feb 2020.

[5] Battery Storage and Grid Integration Program (The Australian National University), Community batteries: a Cost/Benefit Analysis.

4. Qualitative Benefits

As previously mentioned, Evoenergy is still in the process of developing their DER Integration Strategy. This will provide more definitive information on DER Penetration, Hosting Capacity QoS Issue and Capex/Augex plans. This information will be required to robustly quantify the benefits listed below and at this stage no quantified benefit has been applied.

Some of these benefits will also require additional investments such as Customer interfaces to receive and act on DOEs. The type and quantity of investment will not be apparent until Project Converge has completed.

4.1. Wholesale Benefits from Less Curtailment of Generation

The combination of ADMS Enhancements (Improved forecasting, Constraint Management and DOEs) should reduce the level of curtailment of DER and allow for increased hosting capacity. This should lead to wholesale market benefits to all customers from the alleviation of curtailment which allows for a greater level of DER exports. The methodology for calculating this benefit has been set out in their CECV Methodology[6] and is expected to cover the avoided marginal generator SRMC and an approximation of the value of FCAS.

The calculation of the benefits in line with the prescribed methodology will require development of predictions of Evoenergy's current and forecast penetration of the DER and calculation of the curtailment profile that will apply without the ADMS Enhancements. The information will be produced as part of the DER Integration Strategy and this benefit is therefore retained as qualitative only at this stage.

4.2. Deferred Distribution Upgrades for Load Growth using Batteries

The expected community batteries could be at HV or LV and could be controlled to defer upgrades of distribution substations below this network level. These batteries (and VPP batteries) would assist in both management of DER as well as load growth on the network. The ADMS tools are needed to provide

- Accurate forecasting and monitoring of the network
- Dynamic Operating Envelopes for the Operation of PV
- Dynamic Operating Envelopes for the Battery
- Operation and scheduling for when battery assistance is needed to provide network support

In the 'Big Canberra Battery Co-Design Workshop Report'[7] Evoenergy advised there are smaller distribution substations that are nearing capacity limits in locations that are experiencing load growth from urban infill. Small scale distributed batteries, likely LV connected, could be used to alleviate the peak demand constraints. The order of magnitude for volume was thought to be in the 100s of systems across the ACT over 5 years.

The challenge in quantifying the benefit for avoided load growth is the magnitude of the payment to battery operators. The deferred or avoided augmentation would require battery operators to provide services during time of local (and possibly national) system peaks. This could have a high opportunity cost for the battery operators, and they would expect to recover this opportunity cost through charges to the network operator. Whilst this would be capped at the avoided cost of augmentation, it is unclear what the difference would be between these payments and the avoided cost.

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[6] AER, Final Customer Export Curtailment Value Methodology, June 2022.

[7] Battery Storage and Grid Integration Program (An initiative of the Australian National University), Big Canberra Battery Co-Design Workshop Report, 29th April 2021.

At this stage the benefit has not been quantified. However, further investigation of the potential payments may be sufficient to demonstrate a gap between value of avoided augmentation and battery operator charges.

4.3. Avoided Distribution Augmentation from Increased DER

The ACT Government has set out its proposal to reach Net Zero by 2045 and part of achieving this will require small scale solar to be able to connect and generate as much as possible. This aspiration would benefit from higher export limits for small scale generation, but this potentially has implications for augmentation requirements if higher static limits are given to all generators.

A number of areas already have high levels of DER penetration (up to 100%) with consequent issues of reverse power flows and high voltages in the middle of the day. The battery could assist in managing this issue by absorbing the power at times of peak generation. This could assist in both new suburbs that have PV on all new premises and existing suburbs that are growing their DER penetration levels.

It may be possible to achieve high levels of generation and avoid augmentation with better forecasting, constraint management and the use of DOEs. As an example, SA Power Networks offered customers in congested ZSS areas a fixed export limit of 1.5kW per phase or a flexible limit of 1.5kW to 10kW per phase. Customers would need to have compatible equipment and an internet connection. It was expected that exports limits would be at 10kW for 98% of the time[8]

Some assessment is also needed on the likely payment to battery operators if they were used to assist in deferring augmentation. These payments may be relatively low as they would require the battery to charge during periods of low demand, when it may be economically optimal to do so. There may also be an additional investment on customer interfaces to receive and respond to DOEs.

The DER Integration Strategy should provide further inputs on what is needed to confirm the frequency for which hosting capacity would lead to augmentation and which could be avoided with the ADMS Enhancements. When quantifying the benefit there is a need to avoid overlap with the curtailment benefit as the option of augmentation of the network may have resulted in limited curtailment. As this Strategy is still in progress the benefit has remained qualitative at this point.

4.4. Environmental Benefits from Increased DER

Where the ADMS Enhancements lead to less curtailment of Solar generation then there may be environmental benefits if the alternative was fossil fuel generation.

This benefit may only be relevant if there is an ACT Government/Federal Government Requirement to consider the environmental benefits. This would require an emission intensity profile to be applied against the curtailment profile and multiplied by a carbon value. In the absence of this value and the work required to derive this profile this will be retained as a qualitative benefit.

4.5. Reduced Cost of QoS Investigations and Customer Complaints

The enhanced ADMS tools will allow Evoenergy to proactively monitor and respond to QoS problems. This should allow a reduction in customer complaints and result in several potential benefits:

- Reduction in cost of administration and response on complaints
- Reduction in cost of poly loggers
- Reduction in damage to customer equipment

[8] SA Power Networks, Flexible Exports for Solar PV, Lessons Learnt Report 4 [Flexible Exports for Solar PV (sapowernetworks.com.au)]

- Reduction in compensation paid

The complaints could be avoided if the enhanced tool with improved forecasting could highlight potential problems and provide DOEs/control for batteries/DER that avoid these problems.

Some of these problems would also be avoided by power quality improvements that may be part of BAU operation with the introduction of reactive plant at some of the ZSS. However, this would only assist in improving power quality on a small part of the network. At this stage the modelling has limited this to a qualitative benefit rather than quantitative benefit.

4.6. Avoided Transmission Augmentation

Depending on the magnitude of the curtailed generation there may be reduced peak demand at transmission connection points and potentially the avoidance of augmentation. This would depend on constraints existing at the transmission level that could be avoided/deferred by management of DER using the ADMS Enhancements.

At this stage no investigation of transmission constraints has been undertaken and no benefit has therefore been claimed.

5. Costs and Benefit Assessment

5.1. ADMS Enhancement Costs

The NPV of the costs of the ADMS Enhancements compared to BAU are shown in the table below.

Table 5 ADMS Enhancement Costs

Cost	$m Cost	NPV Cost
Initial Capital Cost	$2.75m	$2.72m
Year 2-4 Capital Cost	$0.3m	$0.28m
Total NPV Cost		**$3.00m**

5.2. ADMS Enhancement Benefits

The NPV of the benefits of the ADMS enhancements compared to BAU are shown in table below.

Table 2 ADMS Enhancement Benefits

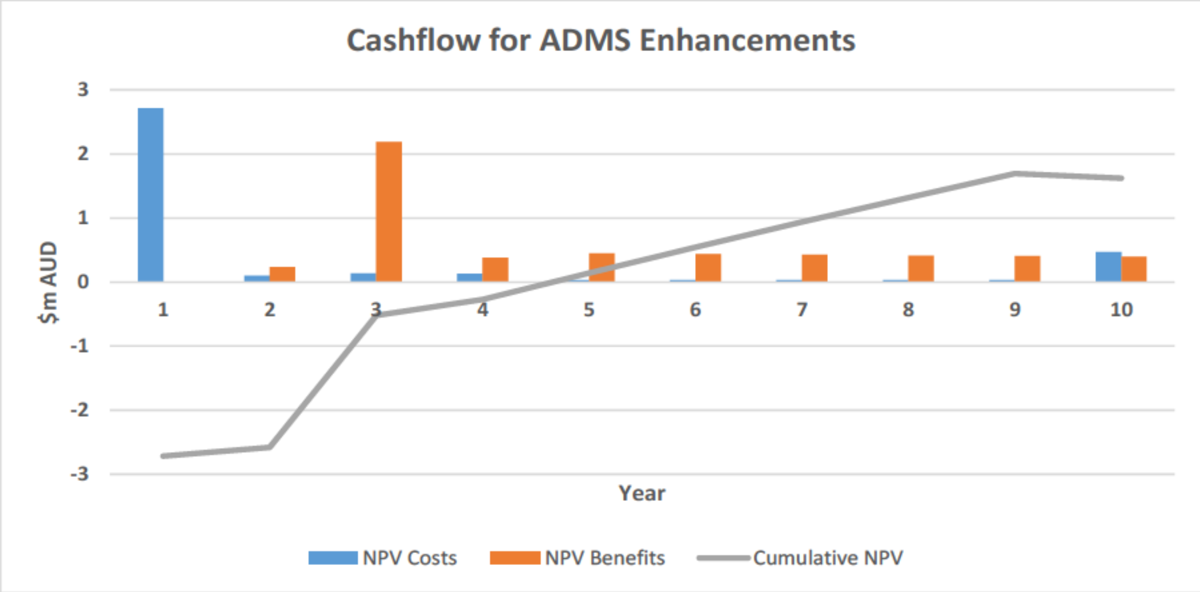
Benefit	$m Benefit	NPV Benefit
Reduced Cost of Payments to Battery Operators	$0.62m	$0.55m
Reduced Cost of Resources for Forecasting and Control	$3.35m	$2.90m
Avoided Net Cost of Power Quality Investments[9]	$1.00m	$1.17m
Total NPV Cost		**$4.62m**

5.3. NPV of ADMS Enhancements

The costs and benefits results in an NPV for the ADMS enhancements of $1.62m compared to a BAU strategy with no ADMS investment. This builds up as shown in the chart below with breakeven point just after year 5. The drop in year 10 reflects a value for the remaining payments to the battery operator for the life of a reactive plant had this been installed. Without this calculation the annual benefit would have remained positive.

[9] This benefit includes the costs of the annual payments to battery operators. This occurs until year 25 and the duration of this cost is why the NPV benefit is higher than the undiscounted benefit.

Figure 2 Cashflow for ADMS enhancements

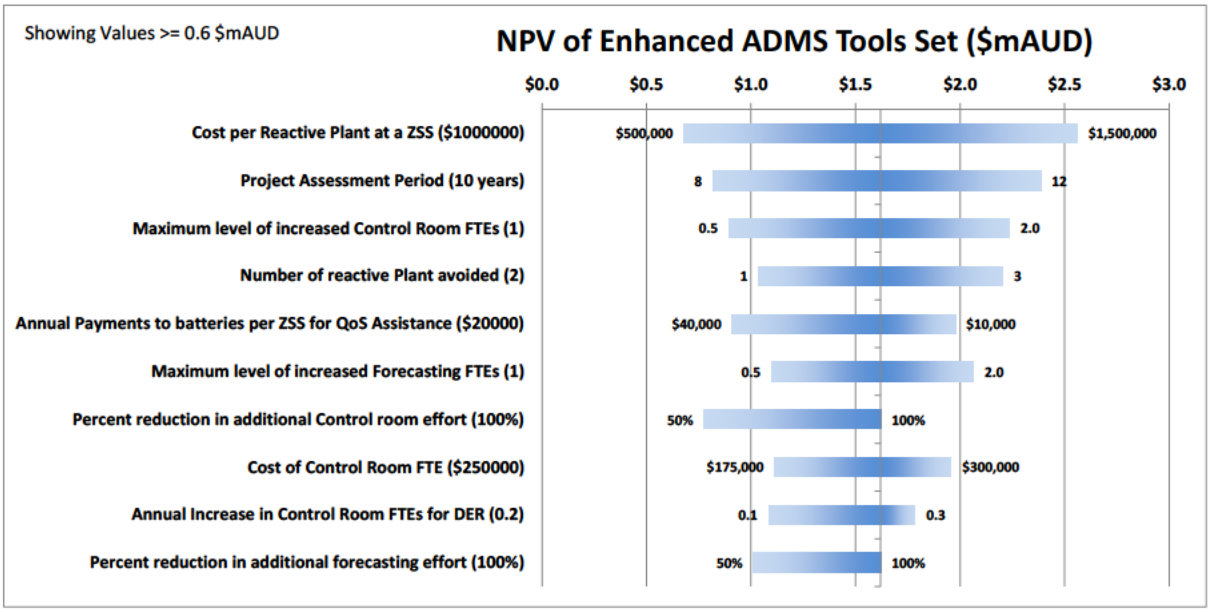


5.4. Sensitivity Analysis

An overview of the sensitivity of the results to changes in some of the key parameters is shown in the chart below. This indicates there is no single parameter that could turn the NPV negative.

The largest impact on the NPV in the sensitivity analysis is the cost of the reactive plant at the ZSS, which is an avoided cost benefit using the ADMS Enhancements. These have been estimated to cost $1m. If this was reduced to $0.5m then the NPV could reduce to $0.7m.

Figure 3 Sensitivity Analysis for ADMS Enhancements



6. Recommendations

6.1. Recommendation for Preferred Option

The NPV assessment provides a comparison between a BAU position where the ADMS remains at its current level of functionality and the scenario where the suite of ADMS Enhancements have been made to the product.   As the DER Integration Strategy is still being developed it is not possible to quantify all the potential benefits facilitated by these enhancements. However, based on the three quantified benefits a positive business case has been demonstrated.

The ADMS enhancements are expected to be a core part of the DER Integration Strategy providing foundational technology required to assess the impact of DER on the network and providing increased visibility and control. They will be essential to deliver the qualitative benefits identified in section 4 of this report.

The modelling is based on the enhancements commencing at the start of the next regulatory period. As there are material benefits each year after implementation then the option of a delay would reduce the NPV of the Project.

Given the positive business case and the wider set of benefits identified, it is recommended that Option 2 - Enhanced ADMS Tools is supported. To maximise the benefits from the ADMS Enhancements these should be implemented in the first year of the regulatory period.

7. Glossary

Term	Meaning
ADMS	Advanced Distribution Management System
BAU	Business as Usual
CECV	Customer Export Curtailment Value
DER	Distributed Energy Resources
DOE	Dynamic (or Shaped) Operating Envelope
EV	Electric Vehicle
FCAS	Frequency Control Ancillary Services
FTE	Full Time Equivalent
ICE	Internal Combustion Engine (vehicle)
NPV	Net Present Value
PV	Photo Voltaic (solar system)
QoS	Quality of Supply
SE	Schneider Electric (vendor)
SRMC	Short Run Marginal Cost
VPP	Virtual Power Plant
ZSS	Zone Substation