AusNet Services 2023-27 TRR
Deep Dive No.1- Operating expenditure

Pre-reading pack

June 2020

Contents of this pre-reading pack

This pre-reading pack outlines:

1. **Choice of opex base year**
2. **Proposed cyber security opex step change**
3. **Proposed transformer oil regeneration works opex step change**

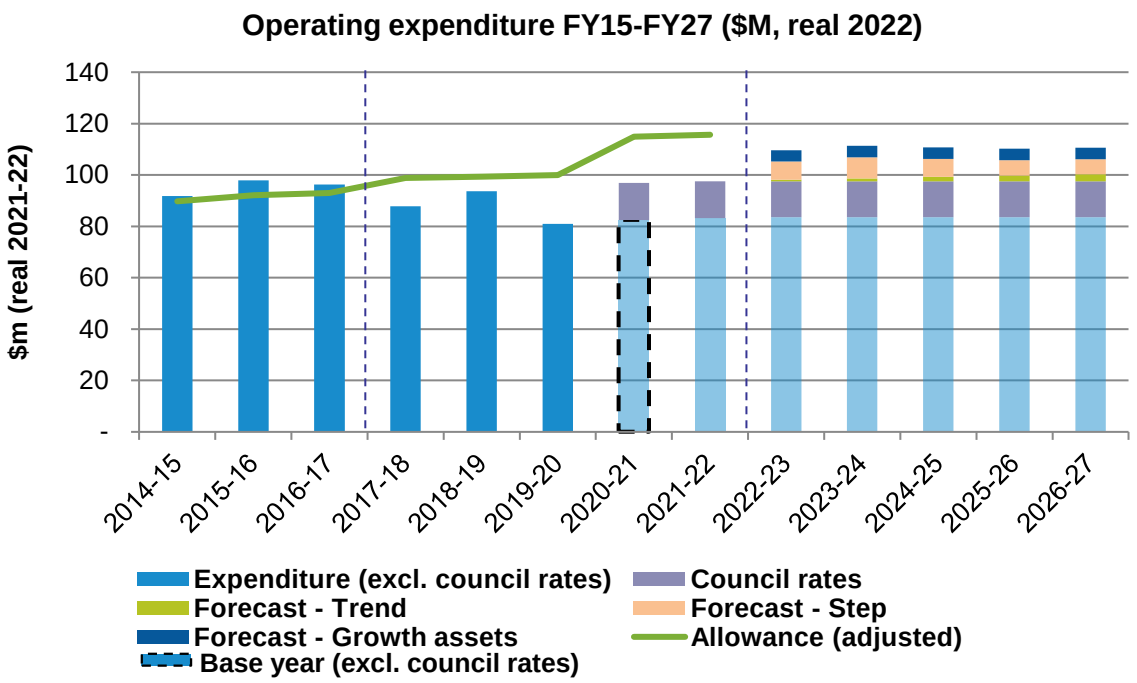
1. Overview of our opex proposal

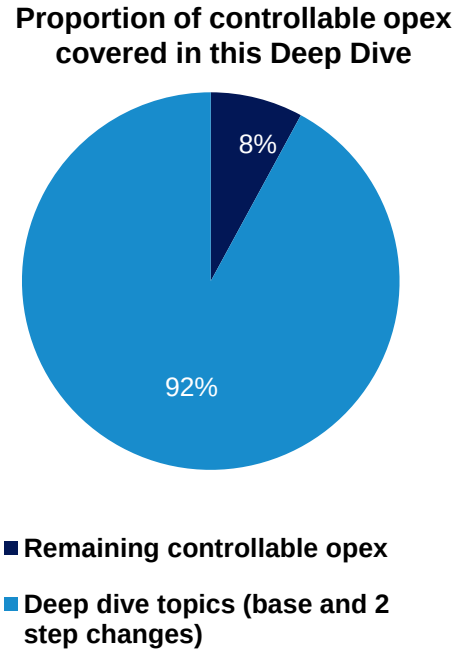
Purpose of this deep dive

- **The purpose of the session is to:**
  - Provide an overview of our proposed operating expenditure (opex) forecast
  - Consult on our customers' preferences in terms of proposed base year
  - Discuss in detail two key step changes being proposed and collect feedback
- **The expenditure forecasts presented in this pack are preliminary in nature and subject to refinement and change before we lodge our Regulatory Proposal with the AER in October 2020**

Our proposed operating expenditure

- **Our proposed opex forecast for the FY23-27 regulatory period (excl. easement land tax and debt raising costs) is $552M, accounting for 39% of our total revenue forecast**
- **The controllable opex forecast (exc. council rates and growth assets)[1] is 7% higher than the expected spend in the current period, driven predominantly by step changes**





Note: allowance has been adjusted to include council rates as pass through is assumed

1. Council rates is anticipated to have a significant impact, increasing from ~$1M in FY20 to ~$14M p.a. in FY21. This impact will be confirmed when FY21 council rates notices are received in July/August

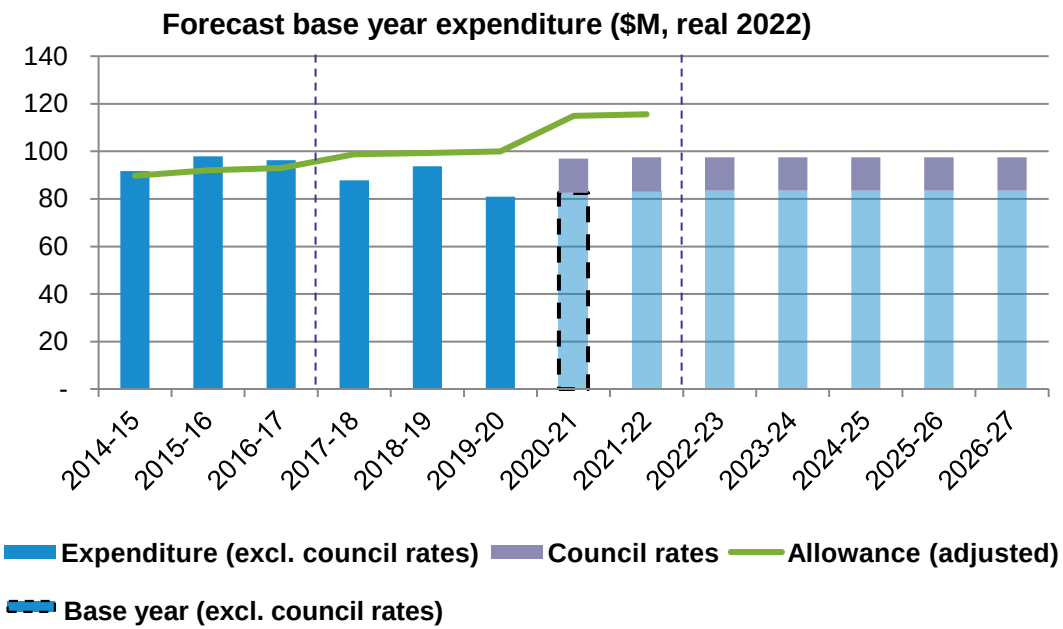
Base-step-trend methodology

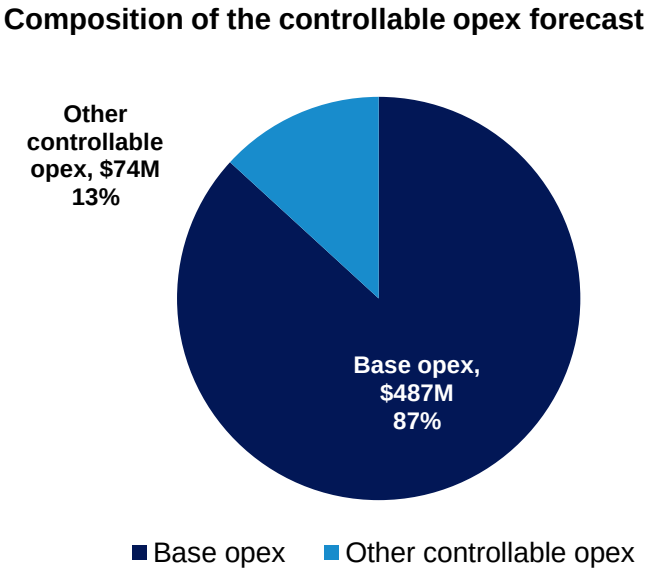
- **Our opex forecasting approach follows the AER's established base-step-trend methodology.**
  - Base: our base expenditure is $487M and accounts for the majority of forecast preliminary opex. Due to interaction with the EBSS, we are revenue neutral as to choice of base year (FY2020 or FY2021).
  - Step: We have seven step changes totalling $34M. Most of these are driven by regulatory requirements while the remaining step changes are driven by efficient capex-opex trade offs. Step changes account for 6% of the controllable opex forecast.
  - Trend: Trend parameters account for $8 million (2%) of the controllable opex forecast.
    - This includes forecast increases in our labour costs (~1% p.a. in real terms) based on average of forecasts prepared by Deloitte Access Economics and BIS Oxford Economics.
    - Consistent with the AER's approach and the views of our Customer Advisory Panel, we have included productivity improvements (~0.14% p.a.), reflecting the annual productivity growth rate the transmission industry has achieved over the long term.
  - Growth assets: we have included $22 million (4%) of the controllable opex forecast for operating and maintaining new assets being added to our asset base in 2023.
    - These assets were built during the current period at the request of AEMO or the Victorian distributors. These are not new costs to customers (AEMO and the Victorian distributors are already recovering these costs from customers).
- **We will subsequently discuss our base and step changes in more detail.**

2. Base year

We propose 2020-21 as our base year

- **The base year accounts for the majority (87%) of our preliminary forecast of controllable opex[1]**
  - We have selected the second last year of the current regulatory period (2020-21) as our proposed base year.
  - Actual costs are not yet available for this year, but will be by the time the AER makes its final determination in January 2022.





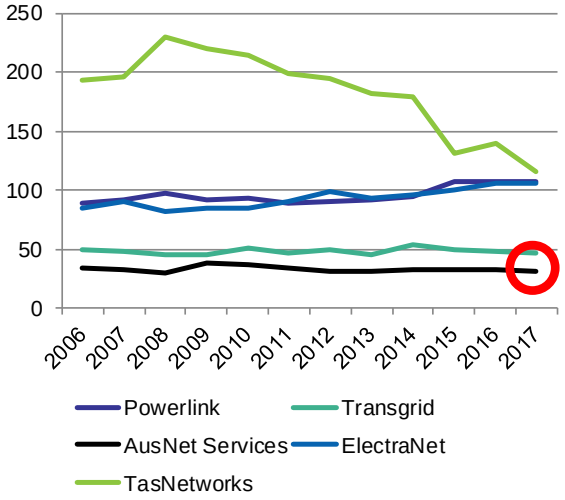
Note: allowance has been adjusted to include council rates as pass through is assumed

1. Controllable opex excludes forecast easement land tax payments and debt raising costs

We are the industry leader in opex productivity

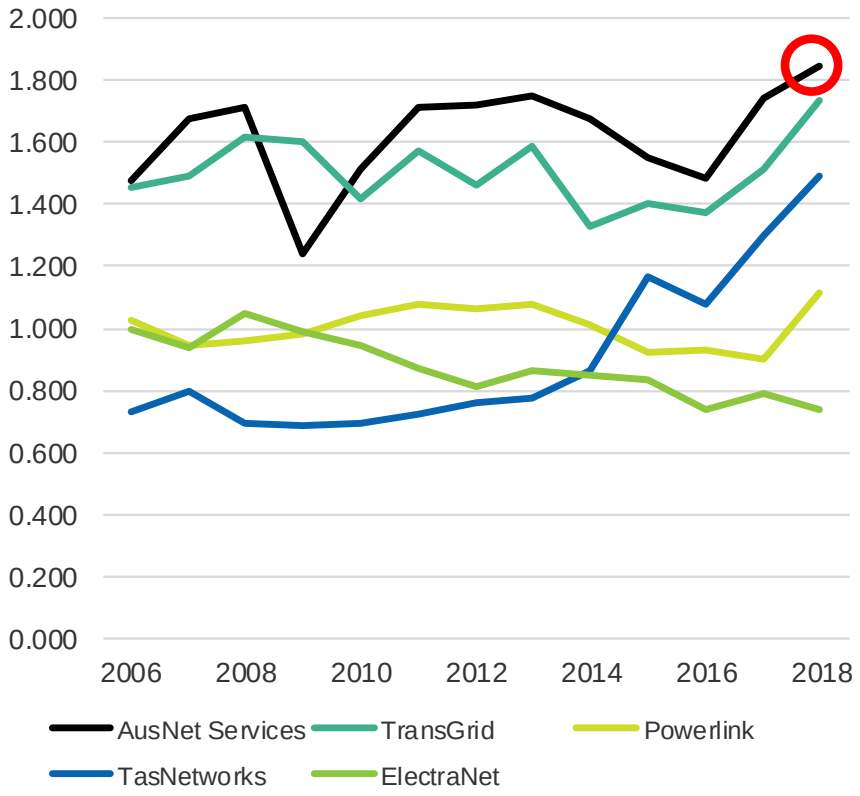
- Independent AER benchmarking shows we have consistently been the industry leader in operating efficiency.
- While an indicative measure, this demonstrates the efficiency of our base year costs, and ensures the preliminary opex forecasts is underpinned by an efficient starting point.

Opex per customer 2006–18 ($'2019)



Source: AER, Electricity transmission network service provider data report, July 2019; AusNet analysis

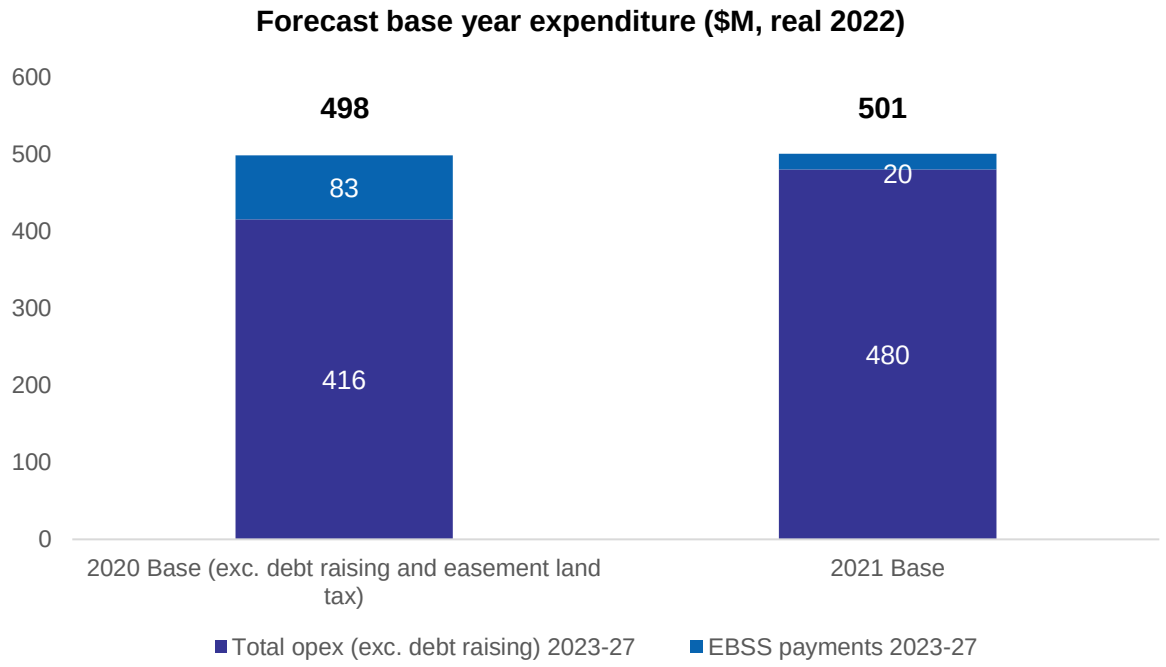
Opex multilateral partial factor productivity index 2006–18 ($'2019)



Source: Australian Energy Regulator, Annual Benchmarking Report: Electricity transmission network service providers (Nov 2019)

We are revenue neutral as to the choice of base year

- **Importantly, efficiency savings made in the current period will lead to approximately $90M less opex and revenue in the next regulatory period than would otherwise be the case.**
- **Due to the Efficiency Benefit Sharing Scheme, AusNet Services and our customers are revenue neutral to the base year selection (i.e. FY20 or FY21) as seen by the below chart which shows a negligible difference between the combined total opex forecasts and EBSS payments.**



Questions

- **Which base year would stakeholders prefer we use for opex forecasting – FY20 or FY21?**
- **Do you need any further information to help inform your views?**

3. Step changes

We are proposing seven step changes

Step change	Description	Forecast opex 2023-27[1]
Cyber Security (New regulatory obligation)	AEMO is intending to provide a direction that we must uplift our capability to a Maturity Indicator Level 3 (MIL 3), which will increase our required resourcing in the current and forthcoming regulatory periods.	$18.8M
5 Minute Settlement (New regulatory obligation)	The Australian Energy Market Commission (AEMC) has amended the NER to align operational dispatch and financial settlement at five minutes, rather than the current 30 minutes, from 2023, which will impact our IT systems and associated resourcing.	$4.9M
EPA (New regulatory obligation)	The Environment Protection Amendment Act 2018 (Vic) comes into effect on 1 July 2020. This law increased our environmental obligations (e.g. site testing, remediation) and associated resources.	$2.7M
Transformer works (Capex/opex trade-off)	Carrying out oil filtering and associated remediation works will address a corrosive sulphur oil issue affecting the transformer fleet, mitigating network risk and avoiding the need for more costly transformer replacement.	$2.5M
Superannuation Guarantee increase (New regulatory obligation)	The Superannuation Guarantee (Administration) Act 1992 will increase superannuation guarantee from 9.5% by 0.5% per annum from 1 July 2021 (up to 12.5% by 1 July 2025). This change will increase our total labour costs.	$2.1M
RIT-T for replacement (New regulatory obligation)	The new requirements to undertake Regulatory Investment Tests (RIT-Ts) for transmission replacement projects will uplift network planning, power system modelling, market modelling and stakeholder engagement resources. While some of these costs will be reflected in our base year, a step change in the volume of RIT-Ts is required in the next period.	$1.8M
Cloud (Capex/opex trade-off)	Certain applications will no longer support on-premise solutions in future, instead they will be cloud based. Moving application from on-premise to cloud-based systems will shift expenditure from capex to opex.	$1.4M
Total		**$34.2M**

1. Dollars are real 2022

Case study #1

Cyber security step change

AusNet services

missionZero

Case study: Cyber security

Overview

Description of need:

- The threats of cyber security issues (e.g. cyber terrorism, extortion) are growing and evolving, including through increased connectivity of DER
- Reliable energy supply, secure business operations and customer data is at risk if appropriate cyber security measures are not in place.
- As the Victorian transmission network is national critical infrastructure, we expect AEMO will require us to uplift our capability to a Maturity Indicator Level 3 (MIL 3) by 2024 under the Australian Energy Sector Cyber Security Framework (AES-CSF).
  - Early AEMO guidance indicated that a regulatory instrument would be in place late 2019.
  - In early May 2020, it was confirmed by AEMO the regulatory instrument would be deferred to early 2021. Once the legislation comes into effect, we may seek a cost passthrough if there are material costs in the current period.
- Reaching MIL 3 will impact capex and opex in the current and forthcoming regulatory periods, requiring a step increase in people, processes and resources needed to monitor, identify, and respond to cyber security attacks.

Significant Recent Cyber Attacks

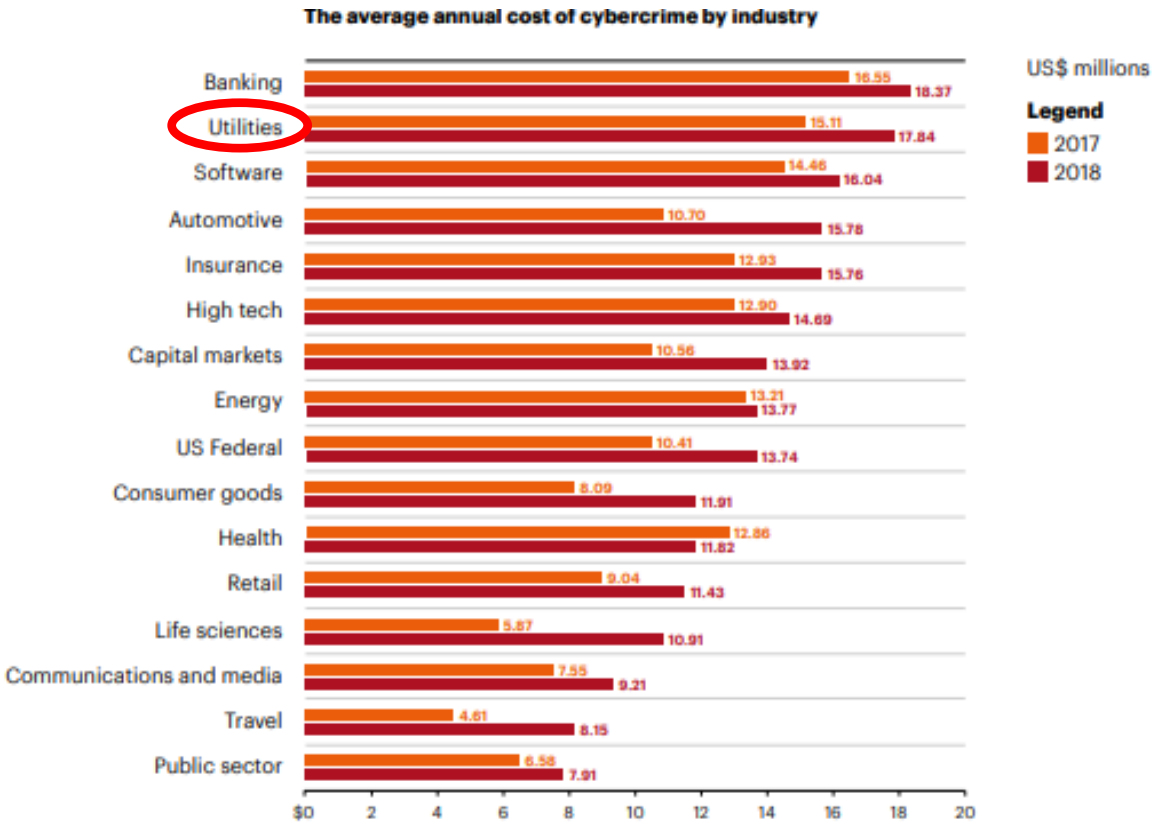
- May: BlueScope, Toll & Elexon (UK)
- April: Energias de Portugal, Israel Water Supply & South Korean utility
- March: US Department of Health, Tesco (UK)
- February: European Electricity Association
- Jan: Toll, US gas pipeline operator
- Nov ‘19: PEMEX (Mexico)

Recently on 19 June, the Prime Minister revealed Australian organisations including essential service providers were actively being targeted in cyber attacks by a “sophisticated state-based actor”

Case study: Cyber security

Threat Profile

- **A 2019 global survey found the average cost of a cyber crime in the utilities sector is US$17.8M**
- **In Australia, the average cost of a cyber crime increased by 26% between 2017 and 2018 to US$6.8M**
- **It is estimated that by 2021, cyber crime will be more profitable than the global trade of all major illegal drugs combined.**



Case study: Cyber security

Australian Energy Sector Cyber Security Framework

AusNet Services' transmission network criticality overall is 'High' per the AES-CSF

AES|CSF Datapoint collect | Australian Energy Sector Cyber Security Framework (AESCSF)

essment Results - AusNet Services

ively populate as you complete your Criticality Assessment.

d this assessment and reviewed your results, please proceed to the next page - **Criticality Asssessment - Submission** to submit your responses.

the Criticality Assessment, your next step is to complete the Framework Self Assessment. Use the drop-down list on the left to select the **Framework Self Assessment** page.

Overall Criticality	Transmission Network Service Provider (TNSP)	Distribution Network Service Provider (DNSP)
High	High	Medium

Figure 3 Timeframe for reaching Maturity Levels

We are currently building MIL2 capabilities in line with AEMO timelines

Case study: Cyber security

Australian Energy Sector Cyber Security Framework

At the March 2020 COAG Energy Council meeting, support for the AES-CSF was re-enforced

"Ministers agreed the Australian Energy Market Operator (AEMO) will continue developing the Australian Energy Sector Cyber Security Framework (AESCSF) and report annually on cyber security preparedness in the electricity sector."

COAG Energy Council, Meeting Communique, Friday 20 March 2020

The AES-CSF consists of 11 domains, 28 objectives, 42 anti-patterns and 240 practices that we evaluate against

Case study: Cyber security

Benefits of MIL3 compliance

Achieving MIL 3 will provide many benefits to customers including to:

- **Uplift our abilities to identify, protect, detect and respond to internal and external threats to our critical infrastructure assets and systems, ultimately minimising any adverse impacts to customer supply or privacy**
- **Maintain security and reliability of the Victorian transmission system, which is ranked as one of our customers most important priorities in internal studies[1]**
- **Continue supporting existing and emerging innovations including large-scale Distributed Energy Resources**
- **Ensure compliance with emerging regulatory requirements**
- **Maintain trust and respect with customers, partners, and regulators**
- **Participate actively in an industry-wide response to cyber threats**

1. Customer Services Benchmarking Australia (August, 2019). AusNet Services Transmission Customer Satisfaction Research Report. Year 2 Report

Case study: Cyber security

Options analysis

We considered three investment options between MIL2 and MIL3

Option 1 Use business as usual budget and resources	Option 2 Uplift existing capabilities including through third party provider support	Option 3 Uplift existing capabilities in-house (no third party support)
• Perform review, update and enhancement activities to achieve MIL 2+ using the current People, Process and Technology capabilities available	• Consume key cyber security capabilities 'as a service', in order to expedite the delivery of MIL 3 capability by leverage scarce skills and wider industry experience • Services would be consumed rather than built in-house, resulting in higher opex (though lower total cost)[1]	• Build in-house capability and services (capex and opex solutions) without using 3rd party or external 'as a service' options to deliver MIL 3 capability

1. Services would be obtained according to our standard procurement processes, which involve a competitive tender process to ensure costs are efficient. Any risks associated with delivery of the services would be managed through contractual arrangements.

Case study: Cyber security

Forecasting approach – costs

We determined the costs involved in each option through a bottom-up approach

Costs

- **We quantified the costs of each option by considering:**
  - Budget and expenditure in previous years
  - Estimations based on market searches
  - Information provided by industry expertise
  - Internal expert review and refinement
  - External expert review and validation of prudent expenditure
- **For the opex step change, this involved calculating the associated labour, contracts and software licencing costs.**

Allocations

- **We determined cost allocations as follows:**
  - The obligation will be placed on our electricity distribution, electricity transmission and gas distribution networks as a single entity.
  - However, the requirement to achieve MIL 3, as opposed to MIL 2, arises mainly through the transmission network.
  - Therefore, we used the standard approach to allocate expenditure required to achieve MIL 2[1]
  - The additional expenditure required to achieve MIL 3 is allocated on a causal basis according to end-customer numbers to ensure costs are fairly allocated.
  - This results in 30% of capex and opex being attributed to electricity distribution, **52% to transmission** and 18% to gas.

1. Our standard cost allocation approach allocates costs under our Activity Based Costing approach as previously accepted by the AER as follows: 49% to electricity distribution, 21% to gas distribution and 30% to electricity transmission.

Case study: Cyber security

Forecasting approach – benefits and risks

We identified and analysed the benefits and risks of the three options, with benefits incorporated into our NPV analysis (see next slide).

Benefits

- **We quantified benefits in our NPV model including:**
  - Market risk (i.e. loss of supply)
  - Risk of system failure requiring internal remediation (e.g. rebuild, rectify data loss)
  - Risk of system failure to public assets (e.g. meters)
  - Productivity impacts to staff from system failure
- **These estimates were based on subject matter expertise of rectification costs and public liability events stemming from a cyber security event including system and/or data repairs, employee productivity or damage to network or customer assets**
- **Benefits relate to our transmission network. Considering these alone may understate the true value of the investment as wider benefits arise relating to our distribution network (e.g. from customer privacy).**

Risks

- **We identified eleven risks associated with implementing each option, including:**
  - Risk of cyber attack impacting critical infrastructure and business operations
  - Failure to detect threats and incidents leading to service disruption and reputational damage
  - Failure to adequately assess, manage and recover from cyber-attach related events including as a result of inadequate numbers of security staff
  - Failure to protect private customer data

Case study: Cyber security

Forecasting approach – NPV of benefits

We conducted NPV analysis to determine the recommended option (see next slide).

› The below benefit streams gained from investing in MIL2+ and MIL3 capabilities use the following common assumptions. The table below provides individual results/assumptions:

- Scope covers cyber events triggering major system failure only (i.e. excludes lesser incidents)
- Increased frequency of cyber attacks over time as vulnerabilities become known to cyber actors
- WACC of 5% applied from FY2023-29

Benefit stream PV	Option 1	Option 2	Option 3	Assumptions
1. Market risk of energy off supply in Victoria	16.9	67.4	67.4	• Consequence value: Victoria off supply for 5 hours with impact to 50% of the State • Probability of occurrence increasing from MIL2 to MIL3 capability, further discounted each year according to number of attacks and effectiveness of IT capabilities
2. System failure risk requiring remediation	1.6	1.6	1.6	• Consequence determined via $300K excess to invoke policy • Probability of occurrence is 50% in years 1-3, ramping up over time as attacks increase
3. System failure risk to public assets	0.7	0.7	0.7	• Consequence determined via $125K public liability excess to invoke policy, discounted by 50% in years 1-3, ramping up over time as attacks increase
4. Productivity impacts to staff	3.1	3.1	3.1	• Consequence assumes staff-wide impact from major system outage, 21 hours time to resolve and an average hourly rate • This is discounted by 50% in years 1 and 2, ramping up over time as attacks increase
Total TRR benefit	**22.2**	**72.8**	**72.8**	

Case study: Cyber security
Forecasting approach – Market risk of energy off supply

Option 1	FY23	FY24	FY25	FY26	FY27	FY28	FY29	Total Market Benefit (all networks)	Total Market Benefit (TRR)	PV Market Benefit (TRR)
Reduced probability of major outage				0.000001						
x Cost of 5 hour outage with 50% impact	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315			
= Reduced cost of major outage due to cyber attack	**5.6**	**5.6**	**5.6**	**5.6**	**5.6**	**5.6**	**5.6**	**39.2**	**20.4**	**16.9**
Option 2 - recommended										
Reduced probability of major outage				0.000004						
x Cost of 5 hour outage with 50% impact	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315			
= Reduced cost of major outage due to cyber attack	**22.4**	**22.4**	**22.4**	**22.4**	**22.4**	**22.4**	**22.4**	**156.8**	**81.5**	**67.4**
Option 3										
Reduced probability of major outage				0.000004						
x Cost of 5 hour outage with 50% impact	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315	$5,599,315			
= Reduced cost of major outage due to cyber attack	**22.4**	**22.4**	**22.4**	**22.4**	**22.4**	**22.4**	**22.4**	**156.8**	**81.5**	**67.4**

Approach

- **Multiply the following:**
  - Reduced probability of major outage
  - Cost of outage
- **This will determine the reduction in cost of a cyber attack as a result of increasing IT capabilities**
- **Multiply total benefits by 52% to get TRR benefits in line with our allocation methodology (see sl 21)**

- **Inputs and Assumptions:**
  - Reduced probability of major outages increases in line with cyber capabilities
  - The cost of a major outage is determined by considering the reduced likelihood of energy lost in Victoria during a 5 hour outage impacting 50% of the State as follows:
    1. Multiplying electricity consumed in Victoria in 5 hours (25,685 mWh) by VCR ($43,600 /mWh)
    2. = the value of electricity off of supply in Victoria during a 5 hour outage as $1,120M, discounting to 50% of the State ($560M)

Case study: Cyber security

Forecasting approach – results of NPV analysis

Summary of results

› We conducted NPV analysis to determine the most cost efficient way to achieve MIL2+ or MIL3. The results are summarised in the table below.

Option	Opex step change (5 year total)	Totex (inc. step change)	NPV Benefits	Risk	Net TRR NPV
1. Achieve MIL 2+ using existing BAU budget and resources	$0M	$9.32M	$22.22M	High	$14.29M
2. Uplift existing capabilities by building capability in-house and using third party provider support to reach MIL 3	$18.1M	$38.69M	$72.76M	Medium	$38.77M
3. Uplift existing capabilities to reach MIL 3 without using third party providers	$20.5M	$56.75M	$72.76M	Medium	$22.89M

Recommended option

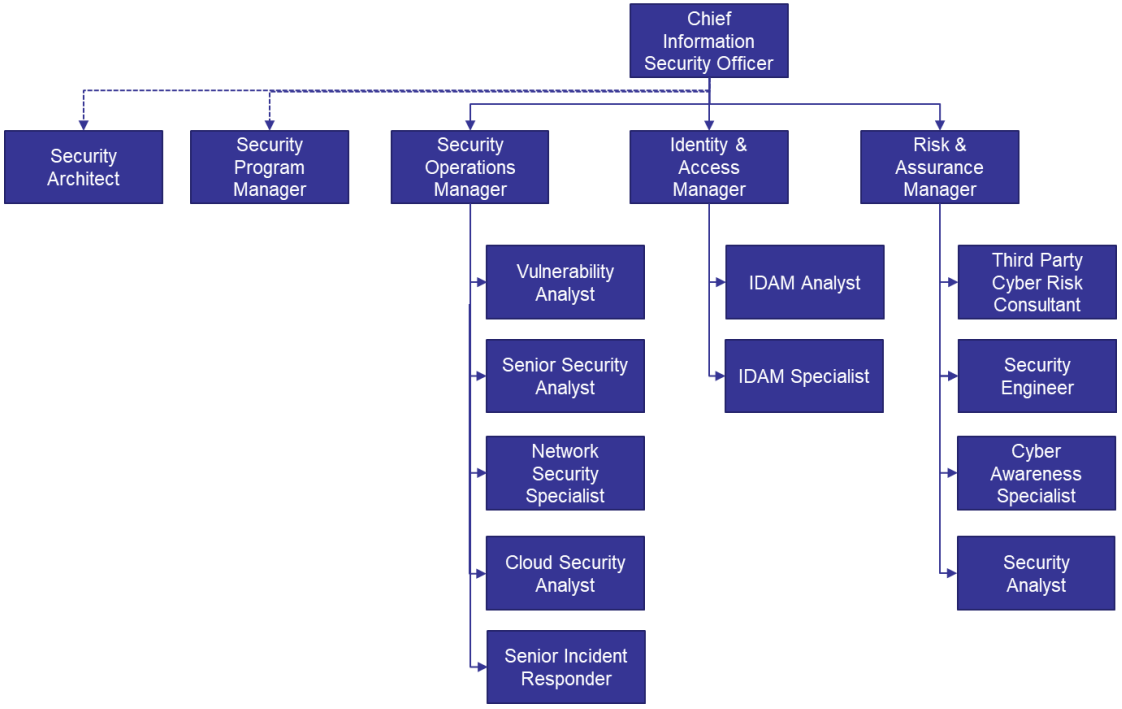
› Option 2 is the recommended option. Through utilising specialist security providers in addition to enhancing in-house capabilities, option 2 provides the most cost efficient investment to achieve MIL 3.

› This option also has the shortest implementation timeline and lower implementation risk than option 3. As option 1 does not meet our objective of MIL3 compliance, it is not considered a viable option.

Case study: Cyber security

Option 2 - resourcing assumptions

- MIL3 requires that a ‘risk and threat’ lens is used to prioritise cyber activities. Opex step change is aligned to uplift risk management capabilities.
- Positions are not aligned strictly to AES-CSF domains, resources are expected to work across various domains



Questions

- **Do you think it is prudent for us to invest in MIL3 capabilities in the absence of a regulatory obligation yet in force?**
- **Who do you think should fund increased investment in Cyber security? Should the uplift from MIL2 to MIL3 be allocated 100% to transmission?**
- **Is there support for the lowest totex option delivering MIL3 capabilities or does the mix of capex and opex matter in a solution?**
- **Who should set the cyber security standards that should be adhered to by networks (e.g. AEMO, TNSPs, other organisations)?**
- **Do you have any views or concerns about the approach used to determine our recommended option?**
- **Do you need further information to help inform your views?**

Case study #2

Transformer oil regeneration works

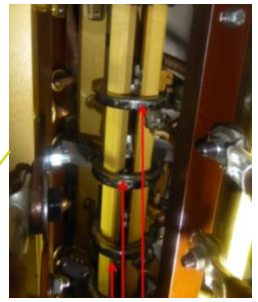
Case study: Transformer oil regeneration works

Overview

Description of need:

- In an industry-wide move, sulfur compound Dibenzyl Disulfide (DBDS) was introduced into the transformer fleet via supplied transformer oil in the late 1990s to 2007 as an oil preservative.
- Over time DBDS has been identified as causing corrosion in first copper and now silver plated copper in the tank and on-load tap changers. This can result in asset failure if left untreated, with cases recorded in utilities internationally including at least 2 in Australia
- We have tested 69 at-risk transmission transformers for the presence of DBDS and found that 22 had high enough levels of sulphur to require remediation works.
- Sound asset management practises mean that we should utilise these assets over their useful lives. As these assets are young (<30 years old), large unnecessary expenditure would be incurred (and ultimately worn by customers) if these assets had to be retired early.
- As a result we intend to carry out a remediation program, namely carrying out oil filtering and associated works, to mitigate network risk and prevent the need for more costly transformer replacement.

Typical on-load tap changer



Corrosion on collector contacts

Corrosion on support structure

Case study: Transformer oil regeneration works

Benefits to customers

Rectifying oil issues will provide benefits to customers including to:

- **Ensure reliability of supply of these transformers**
- **Optimise investment in our transformers in the long term and therefore reduce maintenance and replacement costs ultimately paid by customers**
- **Maintain the safety of our employees and the wider community**
- **Meet industry standards in regards to asset management practices**
- **Avoid environmental damage resulting from transformer failures**

Case study: Transformer oil regeneration works

Options analysis

We considered three investment options to manage the corrosion of the transformers

› The options approach was informed by research from CIGRE, the pre-eminent research forum for large electric systems worldwide, which compiled a working group in 2019 to determine how to rectify DBDS asset corrosion.

Option 1 Do nothing	Option 2 Conduct oil filtering	Option 3 Replace Transformers most at risk
• Do not remediate transformers identified at risk from sulphur corrosion • This option has no upfront costs • This option does not address the associated risks	• Carry out remediation works in at-risk transformers namely to conduct inspections, cleaning and filtering of oil to remove the presence of DBDS on these network assets, noting that some residual risk remains in the population	• Replace the 3 most at-risk transformers in order to completely eliminate the presence of DBDS on these network assets • Carry out inspections/ and cleaning of the remaining at-risk transformers to monitor risk

Case study: Transformer oil regeneration works

Forecasting approach – costs and risks

We have determined preliminary costs and risks involved in each option through a bottom-up approach, which will be refined over time

Costs

- **We quantified the costs of each option by considering:**
  - Budget and expenditure in previous years
  - Internal expert review and refinement
  - External expert best practise when determining options.
  - Known schedule of labour rates
  - Timing determined subject to processing capacity and ability for assets be off supply

Risks

- **We have calculated the risk of a failure by considering the impact on energy customers:**
  - The cost of unserved energy as a result of a transformer failure was determined using the Value of Customer Reliability and average customer numbers, discounted by the reduction in failure risk
- **In addition we identified qualitatively other risks including:**
  - Employee safety
  - Environmental consequences
  - Replacing transformers prior to end of life

Case study: Transformer oil regeneration works

Forecasting approach – risk assumptions

The following assumptions, methodology and conclusions have been used:

› The risk costs associated with each option have been determined using an economic risk model

› These risk costs have been inputted into an NPV model along with the association costs of each option, with key assumptions documented below

1. NPV conducted over 20 year timeframe in line with remaining asset life of the transformers in question.
2. Commercial discount rate of 4.68%
3. The consequence has been valued by considering the potential unserved energy multiplied by a Value of Customer Reliability (VCR) as follows:
   a) Unserved energy determined by considering typical terminal station load levels of an example site, the probabilities of failure under a full range of better and worse scenarios (i.e. failure of 1, 2 or all transformers), and average expected mean time to repair
   b) This is multiplied by VCR ($28,456/MWh)
4. Under option 1, the condition of an untreated transformer is assumed to carry a C4 rating, which has an assigned failure rate of 3.41% p.a.[1]
5. Under option 2, asset condition improves to C3 with a failure rate of 1.57% once oil filtering occurs, resulting in a reduced failure rate by 1.84%.[2]
6. Under option 3, the three most at risk transformers are replaced over a period of 3 years costing $6 and eliminating their risk of corrosion. Inspections of remaining transformers take place on a rolling five year basis, minimise remaining risk to C3 levels, and assuming a further four replacements during the 20-year period of analysis.

1. Asset condition rating C4 requires remedial action or replacement within 2-10 years
2. Asset condition rating C3 requires no additional specific actions, continue routine maintenance and condition monitoring

Case study: Transformer oil regeneration works

Forecasting approach – results

Summary of results

› The project costs and risks are detailed in the below table (amounts shown are in $M's).

› Note while the table below includes some risk costs related to unserved energy we are still in the process of conducting an economic analysis to capture other risks (e.g. safety) involved in option 1 (which results in the figure below being understated currently).

›

	FY2023-2027		FY21-FY42		
Option	**Opex step change**	**Capex**	**NPV costs**	**NPV risk reduction (i.e. benefit)**	**NPV net**
1. Do nothing	$0.0	$0.0	$0.0	-$109.3	-$109.3
2. Conduct oil filtering	$2.4	$2[1]	$4.8	$51.6	$46.7
3. Replace at-risk transformers	$1.8	$18	$29.8	$58.4	$28.6

1. Work will commence as soon as practicable subject to customer views on the preferred option

Recommendation

› Option 2 is the most economic option and therefore is the recommended option. Conducting remediation activities will reduce associated risks to an acceptable level and accordingly mitigate safety and stability of supply risks to customers in the most cost efficient manner. This option is significantly less costly than option 3, and has a better balance between cost and risk

› Option 3 would address the risk, but is not economic due to the significant replacement costs involved

› Option 1 carries an unacceptable level of risk, which can be economically addressed, so is not considered a viable option.

Note. We also considered another opex solution of replacing the oil. However this was discounted as the cost of this program was significantly ($15.4M) higher than option 2 and would fail to remove the presence DBDS, resulting in a continued risk of future corrosion.

Snapshot: Transformer oil regeneration works

Recommendation option

Recommended option 2 opex forecast

› The remediation program will commence this year and take 4-5 years in total.

› Below we show the forecast annual step change opex for option 2.

- This is net of the forecast $0.65M expenditure we expect to incur in the base year (FY2021).

$'22, M	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	Total FY2023-27
Total opex	0.65	1.47	1.47	1.47	1.47	0.00	0.00	4.41
Opex step change	**0.00**	**0.82**	**0.82**	**0.82**	**0.82**	**0.00**	**0.00**	**2.45**

Note: numbers may not reconcile due to rounding

Questions

- **Are the current levels of risk high enough to warrant treatment of these transformer assets?**
- **Do you have any views or concerns on the approach used to determine our recommended option?**
- **Do you need further information to help inform your views?**

End

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