Memo

To:	Guy Mutasa (Energy Queensland)
From:	Dinesh Kumareswaran, Ben Mason (Frontier Economics)
Date:	1/11/2024
Subject	**Assessment of counterfactual for repex forecast business cases**

1. Introduction

Frontier Economics has been engaged by Energy Queensland (EQL) to provide advice on defining the appropriate counterfactual for use in the cost benefit analyses (CBA) within business cases that support Ergon Energy's replacement expenditure (repex) forecast proposals to the Australian Energy Regulator (AER) for the 2025-30 regulatory control period, and whether the choice of counterfactual impacts the choice of preferred option in cost benefit analyses.

This memo first summarises key findings. It goes on to outline the context and background to the key issue dealt with in this memo and explains the role of the counterfactual in cost benefit analysis. It then summarises the AER's guidance on the counterfactual, examples of AER decisions related to counterfactuals in other regulatory proposals before returning to the issue of whether it is possible to 'bias' a cost benefit analysis.

2. Key findings

The key findings of our assessment of counterfactual for repex forecast business cases are:

- AER guidance and previous decisions on defining the counterfactual are unclear and appear inconsistent over time and between regulatory decisions. This has created confusion amongst network service providers (NSPs) over how the AER expects the counterfactual used cost benefit analyses should be defined. To avoid future confusion, and to improve consistency (in both regulatory proposals by NSPs and decisions by the AER), it would be helpful for the AER to clarify how the counterfactual scenario for cost benefit analyses should be defined, and why the AER's preferred definition is appropriate.
- The AER draft decision feedback on Ergon Energy's counterfactual for repex forecast business cases can be interpreted a few different ways from a recommending a 'do nothing' to a 'do minimum' counterfactual.
- We disagree with the AER's contention that the Ergon Energy's chosen counterfactual biased the outcomes of the cost benefit analysis towards Ergon Energy's preferred option. The nature of cost benefit analysis is that it is an incremental analysis of options compared to a counterfactual. Given this, unless the analysis is missing an option which provides the highest expected net benefits (i.e., the highest NPV option), the particular counterfactual selected will not bias the outcome of the cost benefit analysis. This is because the ordering of

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the options assessed (ranked by NPV) will remain unchanged, even if a different counterfactual were adopted, notwithstanding that the NPV of each option (relative to the counterfactual) would differ.

3. Context and background

Ergon Energy submitted cost benefit analyses/business cases as part of its regulatory proposal to the AER, including cost benefit analyses for its repex activity. An example of the counterfactual and options within one of these business cases (related to pole replacement) is summarised in Box 1.

Box 1: Poles replacements business case

In the pole replacements business case, a counterfactual based on historical volumes based on average delivered volumes for the previous three years was compared to four options:

1. REPEX model cost scenario – prioritised replacement/reinforcement for poles based on REPEX model cost scenario
2. Health index based replacement – proactive replacement of all poles assessed with a health index over 7.5
3. AER REPEX model lives scenario – based on REPEX model lives scenario
4. Additional target replacements – additional proactive replacement of 2000 poles per annum compared to the counterfactual

For reference, the pole replacement volumes in each option is presented in the below table from the business case:

Replacement Volumes						
		2025-26	2026-27	2027-28	2028-29	2029-30
	Counterfactual	16,622	16,622	16,622	16,622	16,622
Option 1	REPEX Cost Scenario	10,413	10,413	10,413	10,413	10,413
Option 2	Health Index	13,250	13,250	13,250	13,250	13,250
Option 3	REPEX Live Scenario	5,745	5,745	5,745	5,745	5,745
Option 4	Counterfactual +2k Targeted	18,622	18,622	18,622	18,622	18,622

Source: Ergon Energy (2024), Pole Replacements Business Case

In its draft decision for Ergon Energy, the AER stated the following based on its bottom-up review of repex:

We observed some improvements in Ergon Energy's supporting material where it has undertaken risk-cost modelling. However, contrary to its own statements, it did not rely on the results of the modelling to derive its forecast. Instead, we found that its forecast was based on a continuation of its current level of asset replacement for each asset class. Its forecast therefore continues the high levels of replacement activity and expenditure that we consider Ergon Energy has not adequately justified in the ex-post period. This includes continued high inefficient levels of opportunistic

replacement where assets are replaced earlier than efficient. We also found its cost benefit analysis contained a number of errors, overstated benefits, and was biased towards its preferred option.[1]

Further feedback on the counterfactual is provided in the draft decision, which states:

Where Ergon Energy has undertaken a cost benefit analysis, EMCa [independent engineering/ technical consultant engaged to undertake its own ex-post review in parallel to the AER] found errors, incorrect application of the counterfactual that biases towards Ergon Energy's preferred option, and overstated benefits.

EMCa found that Ergon Energy's counterfactual is a continuation of Ergon Energy's current practice where the CBA provides no assessment of the net benefits of its proposal. Instead, the CBA assumes (without demonstrating this) that the current policy has a net benefit and then measures only the variance in NPV of standardised alternative options relative to this.[2]

Section 7 below addresses the AER's concern that the Ergon Energy's choice of counterfactual in some way biased the outcome of the cost benefit analysis towards Ergon Energy's preferred option.

One interpretation of the concern expressed by the AER (and its adviser, EMCa) about Ergon Energy's choice of counterfactual is that the counterfactual scenarios adopted in Ergon Energy's cost benefit analyses assume some replacement activity, but the efficiency and prudency of that replacement activity has not been demonstrated. In other words, the AER appears to be concerned that the efficiency and prudency of repex in the counterfactual has simply been assumed, rather than justified through the cost benefit analyses.

This is not an unreasonable observation, in our view. Under the National Electricity Rules (the Rules), the AER may only accept a distribution network service provider's (DNSP's) capital expenditure forecast if the forecast capital expenditure reasonably reflects the capital expenditure criteria defined in the Rules (see Box 2).

Box 2: The capital expenditure criteria

Rule 6.5.7(c) defines the *capital expenditure criteria* as:

(i) the efficient costs of achieving the *capital expenditure objectives*;

(ii) the costs that a prudent operator would require to achieve the capital expenditure objectives; and

(iii) a realistic expectation of the demand forecast, cost inputs and other relevant inputs required to achieve the capital expenditure objectives.

[1] AER (2024), Draft Decision for Ergon's Energy distribution determination 2025-30 (1 July 2025 to 30 June 2030) Overview, pp. 21-22.

[2] AER (2024), Draft Decision for Ergon's Energy distribution determination 2025-30 (1 July 2025 to 30 June 2030) Attachment 5 Capital Expenditure, pp. 49-50.

Rule 6.5.7(a) defines the capital expenditure objectives as the following:

(1) meet or manage the expected demand for standard control services over that period;

(2) comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;

(3) to the extent that there is no applicable regulatory obligation or requirement in relation to:

  (i) the quality, reliability or security of supply of standard control services; or

  (ii) the reliability or security of the distribution system through the supply of standard control services,

  to the relevant extent:

  (iii) maintain the quality, reliability and security of supply of standard control services; and

  (iv) maintain the reliability and security of the distribution system through the supply of standard control services;

(4) maintain the safety of the distribution system through the supply of standard control services; and

(5) contribute to achieving emissions reduction targets through the supply of standard control services.

Source: National Electricity Rules

That is, before accepting a DNSP's capital expenditure forecast, the AER must satisfy itself that the forecast expenditure is prudent, efficient and realistic.

According to the draft decision, the AER's concern with the counterfactual adopted by Ergon Energy is that it assumes, rather than demonstrates, that a base level of forecast repex is prudent, efficient and realistic.

There is some confusion about what the AER considers should be used as the counterfactual to overcome this concern. One interpretation of the draft decision is that Ergon Energy's cost benefit analyses should assume no repex at all. The various options considered by the DNSPs would then be assessed against this 'do nothing' scenario, and the option with the highest NPV would be selected as the preferred option underpinning the DNSPs' repex forecast. This formulation of the cost benefit analysis would ensure that all forecast repex would be tested for prudency and efficiency, because a do nothing counterfactual scenario assumes no repex at all.

We understand that in discussions following the publication of the draft decision, the AER has clarified to EQL that it is not seeking a 'do nothing' counterfactual but, rather, is concerned that the counterfactual for some repex forecast business cases are based on repex levels from the 2018-23 ex-post review period that have not yet been approved by the AER as prudent and efficient through an ex-post capex review process.

We understand that the AER has advised EQL that the counterfactual scenario should be defined in one of the following two ways:

1. business-as-usual repex based on a more typical volume of historical replacement (e.g., the level of replacement that occurred over the 2015-20 regulatory control period), rather than the increased volume of replacement undertaken by Ergon Energy over the 2018-23 ex-post review period; or

2. a forecast of repex that the AER has previously accepted as being prudent and efficient.

Under both of these scenarios, there would be some level of repex activity.

The first option could potentially be a reasonable counterfactual scenario. However, it could be that the DNSP now has new information that indicates that the historical level of replacement activity was either too low or too high to be considered prudent and efficient. In these circumstances, the AER's proposed counterfactual would be based on outdated, rather than current, information on the most prudent and efficient level of expenditure.

There could be a good reason for the most recent replacement levels being higher (or lower) than was actually achieved over some historical period, for example changes in the risk profile of for the asset replacement or due to new information that suggests more or less replacement activity is actually required, relative to what was delivered historically, in order to maintain appropriate service levels.

The second option proposed by the AER suffers from a similar weakness. The DNSP may have gained new information over the course of the current regulatory control period that reveals that the repex forecasts previously accepted by the AER were too low (or too high) relative to the true level of prudent and efficient opex. This is not surprising since the AER can only assess the prudency and efficiency of expenditure forecasts using the imperfect information available to it at that time. New information may come to light that renders the forecasts assessed and approved by the AER obsolete.

This fact is an integral part of the AER's incentive-based regulatory framework. The AER provides DNSPs with financial incentives (e.g., through the Capital Expenditure Sharing Scheme) to seek out and deliver improvements in cost efficiency over each regulatory control period, so that the benefits of those efficiency gains can be shared with consumers in future periods. This incentive framework relies on the fact that new information becomes available to DNSPs in each regulatory period about the true level of prudent and efficient expenditure required to deliver regulated services, which the DNSP can exploit to realise efficiency improvements. The framework recognises that the forecasts of expenditure previously accepted by the AER will become redundant as this new information becomes available.

In summary, both the alternative counterfactual options suggested by the AER suffer from the same fundamental weakness—they are based on information that may be outdated and, therefore, not reflective of prudent and efficient replacement activity.

Nevertheless, as discussed in section 7 below, the choice of counterfactual will not bias the outcome of a cost benefit analysis. Therefore, flawed as these options are, in our view there is no harm in adopting any of these options, provided that the results of the cost benefit analysis are interpreted properly.

4. Role of counterfactual in cost benefit analysis

Cost benefit analysis is an incremental analysis that compares monetised economic, environmental and social costs and benefits of an intervention or action over time to a base case (or counterfactual). To allow options (including the base case) to be compared directly, discounting is applied to derive the present values of cost and benefit streams.

The specification of the base case is key to a meaningful cost benefit analysis. Generally, the base case should be defined as the most credible state of the world in the absence of an intervention. That is, the base case should represent a 'business-as-usual' approach over time.

Perhaps the clearest guidance on how to define a base case for cost benefit analysis is provided by Infrastructure Australia. This is useful as Infrastructure Australia's guidance is commonly followed by major infrastructure projects, as it is a requirement for a project to be placed on

Infrastructure Australia's Infrastructure Priority List. It also has broad alignment with Commonwealth, State and Territory Treasury guidance for cost benefit analysis. While we are not suggesting that Infrastructure Australia's guidance outranks that of the AER, it is a useful point of reference because it is considered guidance by an expert body concerned with the efficient investment in infrastructure with the aim of maximising societal welfare.

Infrastructure Australia's *Guide to economic appraisal: Cost-benefit analysis methodology* states that:

> *The base case is a real world scenario of what is expected to occur in the absence of the project case. It is required to measure what will happen without an intervention.*[3]

At a high-level there are broadly two options for what would happen without an intervention:

3. 'Do nothing' – where there is no expenditure in the relevant infrastructure; or
4. 'Do minimum' – where there is limited expenditure in the relevant infrastructure to maintain it to a reasonable standard (often the current level of service).

There are only limited situations in which a 'do nothing' business case is appropriate. For example, a 'do nothing' base case may be appropriate for a business case looking at a new road bypass for a town.

Infrastructure Australia goes further and states that a 'do minimum' base case should always be used:

> *The base case should represent a 'do-minimum' situation,*[4] *reflecting the continued operation of the network or service under good management practices (the 'business as usual' or 'keep safe and operational' situation). Importantly, the 'do-minimum' case is not the same as a 'do-nothing' case, as it should include relevant minor improvements to the infrastructure network or services that can reasonably be expected to occur in the absence of the project case. This will require careful consideration in rapidly developing areas or where significant investment is planned.*
>
> *A 'do-minimum' base case assumes that general operating, routine and periodic maintenance costs will continue to occur, plus a minimum level of capital expenditure to maintain services at or near their current level without significant deterioration (for example, maintaining access or service quality). This may include asset renewals and replacement of life-ending components on a like-for-like basis, as well as committed and funded projects and smaller scale changes required to sustain viable operations under the base case.*[5]

[3] Infrastructure Australia (2021), Guide to economic appraisal: Technical guide of the Assessment Framework, p. 17.

[4] Every Commonwealth, State and Territory guidance document recommends a 'do-minimum' base case.

[5] Infrastructure Australia (2021), Guide to economic appraisal: Technical guide of the Assessment Framework, p. 17-18.

More broadly, cost benefit analysis is an incremental analysis and is most commonly used to compare an intervention to a base case. Once the value proposition of an intervention compared to the base case has been established, it may be useful to do an incremental analysis of this intervention to larger interventions such that the value of the incremental costs and benefits of this additional expenditure are clear.

5. AER guidance on counterfactual

Focussing on the specific AER guidance for repex, the AER states that the purpose of its *Industry practice application note: Asset replacement planning (2019)* is to "support network businesses in adopting good practice asset replacement planning."[6] This practice note states the following about the relevant counterfactual when assessing certain asset management decisions:

> *When analysing options for asset retirement or de-rating decision-making, the counterfactual (or base case) represents the 'business-as-usual' (BAU) cost of service. That is, the expected cost that would be incurred if the asset is not retired or de-rated, but remains in service, operated, and maintained on a BAU basis.*
>
> *The counterfactual represents the costs that consumers would incur if the asset continued to be operated under the standard operating and maintenance practices that the business would generally apply. This can be thought of as the costs that would arise in the case of 'doing noting [sic] materially different' from the usual practices of the business under its usual asset management practices.*[7]

The practice note goes on to say that:

> *The purpose of the counterfactual is to capture a reasonable and logically consistent view of the expected service costs if a BAU approach was maintained (i.e. no materially different costs). The counterfactual can also be thought of as the expected service cost that could be avoided if some alternative course of action (i.e. an alternative intervention) was taken. Hence the counterfactual (or base case) provides an expected service cost outcome against which the cost of other options (i.e. interventions) can be compared to demonstrate the service cost value of those options relative the counterfactual (or base case) service cost.*[8]

6. Relevant AER decisions on counterfactual in revenue decisions

One example of previous AER decisions on the counterfactual in pricing submissions is contained in their final decision on Ergon Energy's 2020-25 proposal (*Final Decision Ergon Energy*

[6] AER, Industry practice application note for asset replacement planning. Available at: https://www.aer.gov.au/industry/registers/resources/reviews/industry-practice-application-note-asset-replacement-planning [accessed 2/10/24]

[7] AER (2019), Industry practice note: Asset replacement planning, p. 27

[8] AER (2019), Industry practice note: Asset replacement planning, p. 27

Distribution Determination 2020-21 to 2024-25: Attachment 5 Capital expenditure). This includes the following on the counterfactual:

> *Some of Ergon Energy's models are based on an inaccurate business-as-usual counterfactual position, while others are a 'do-nothing' counterfactual. For example, the counterfactual option in its poles model is based on replacement volumes that do not align with its actual reported historical replacement volumes. We asked Ergon Energy about this misalignment but it did not provide an explanation for the discrepancy.*
>
> *In other cases, Ergon Energy did not apply a 'do-nothing' counterfactual in its analysis. For its communications site infrastructure program, Ergon Energy stated a counterfactual 'do nothing' option was considered but rejected, as failure to replace buildings and structures would result in deterioration of the infrastructure's condition resulting in unacceptable risk to the communication network and increase the risk to staff, contractors and the community. However, Ergon Energy did not quantify these risks, despite the feedback we provided in our draft decision and throughout our ongoing engagement. Ergon Energy's analysis highlights this program is NPV negative, and due to the lack of benefit quantification, it selected the least negative of the three options considered.*[9]

Focussing on the poles replacement, the AER appears to question how the business-as-usual (or 'do minimum') base case was defined, as opposed to proposing that a 'do nothing' base case should be applied. This would be consistent with the EQL discussion with the AER following the draft decision.

Another example is provided in the AER's draft decision on Essential Energy's 2024-29 proposal (*Draft Decision Essential Energy Distribution Determination 2024 to 2029: Attachment 5 Capital expenditure*). This draft decision includes the following on Essential Energy's Consumer Energy Resources business case:

> *Essential Energy noted that these options were compared with a base case scenario, however its base case represents a "do nothing" scenario, which does not include any costs (such as business-as-usual voltage management activities) and therefore provides no benefits. It would be prudent to compare the proposed investment in a DOE [dynamic operating envelope] solution with a scenario that includes a more moderate level of investment.*[10]

While we acknowledge that the Essential Energy example above does not relate to repex, the relevant AER guideline (*DER integration expenditure guidance note*) also includes the requirement for a business-as-usual base case.

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9 AER (2020), Final Decision Ergon Energy Distribution Determination 2020-21 to 2024-25 Attachment 5 Capital expenditure, p. 5-23

10 AER (2023), Draft Decision Essential Energy Electricity Distribution Determination 2024 to 2029 (1 July 2024 to 30 June 2029) Attachment 5 Capital Expenditure, p. 27

The AER's past guidance to DNSPs on the appropriate counterfactual to use when conducting cost benefit analyses is confusing. There are cases where the AER states that a 'do minimum' counterfactual should be applied (as in the Essential Energy example above) and others where the AER states that a 'do nothing' counterfactual should be applied. This makes it difficult to understand whether the AER is seeking different counterfactuals for different types of expenditure (and if so, why and in what circumstances) or is inconsistent in its guidance on the appropriate counterfactual.

7. Concern about introducing bias in cost benefit analysis

The draft decision indicates that Ergon Energy's choice of counterfactual biased the outcome of the cost benefit analyses it presented in its regulatory proposal:

> *Where Ergon Energy has undertaken a cost benefit analysis, EMCa found errors, incorrect application of the counterfactual that biases towards Ergon Energy's preferred option, and overstated benefits.*[11]

It is possible to introduce bias into cost benefit analysis but only in quite specific circumstances. The incremental nature of cost benefit analysis (i.e., the fact that the net benefits of each option are assessed by measuring the net benefits of that option relative to a counterfactual scenario) means that, provided a credible range of options are assessed, the most net beneficial solution will always become apparent. This means that a cost benefit analysis can only be biased if it is mis-specified—for instance by:

- double counting a benefit;
- including a transfer in the analysis; or
- failing to include the optimum option within the cost benefit analysis.

It is unclear to us exactly what the AER and EMCa mean when they suggest that Ergon Energy's choice of counterfactual biased the outcomes of the cost benefit analyses presented. One possible interpretation is that the cost benefit analyses would have identified a different set of options as the most prudent and efficient if a different, more correct counterfactual had been selected.

However, it is important to recognise that even if an alternate counterfactual had been adopted by Ergon Energy, the same ranking of options would have obtained from the CBAs.

The NPV of each option would have differed, given that each option would be compared to an alternative counterfactual. However, using the AER's preferred counterfactual would not have identified a different optimal repex option. This point is demonstrated by the illustrative example in Box 3. The only exception to this rule would be if a counterfactual which was not included in the analysis that had performed better than all other options tested.

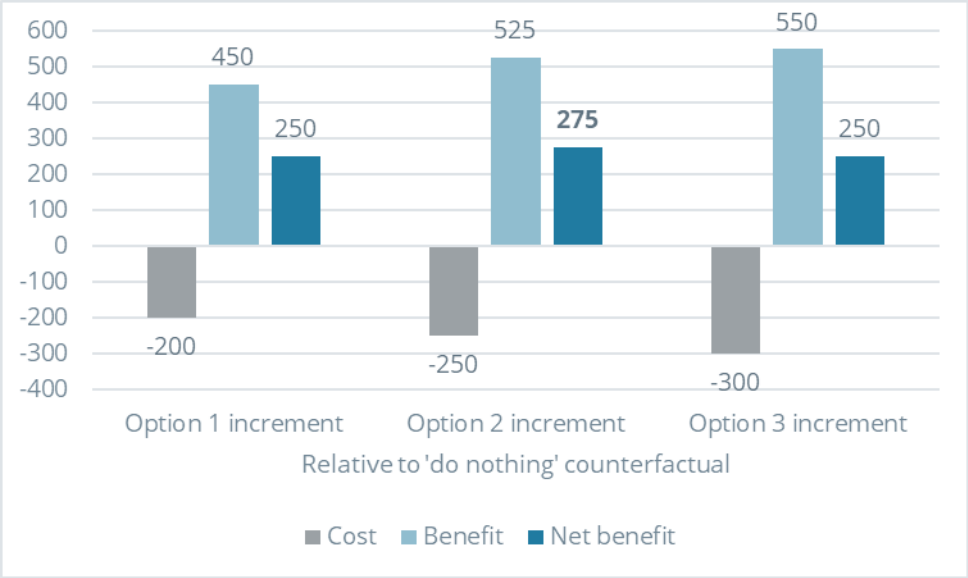
[11] AER (2024), Draft Decision for Ergon's Energy distribution determination 2025-30 (1 July 2025 to 30 June 2030) Attachment 5 Capital Expenditure, p. 49.

Box 3: Impact of differing counterfactuals – hypothetical example

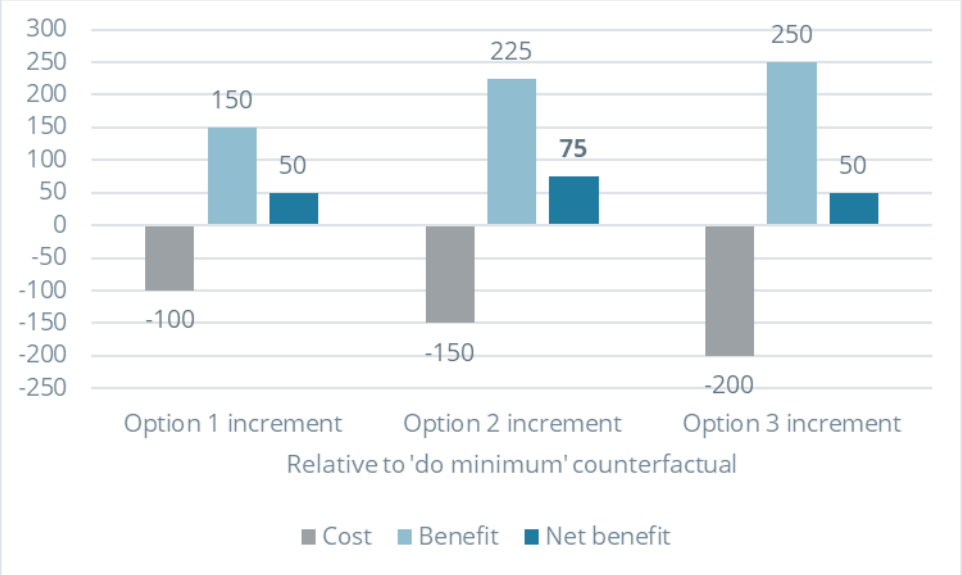
Take the following set of hypothetical options, costs, and benefits:

	Cost	Benefit
'Do nothing' counterfactual	0	0
'Do minimum' counterfactual	-100	300
Option 1	-200	450
Option 2	-250	525
Option 3	-300	550

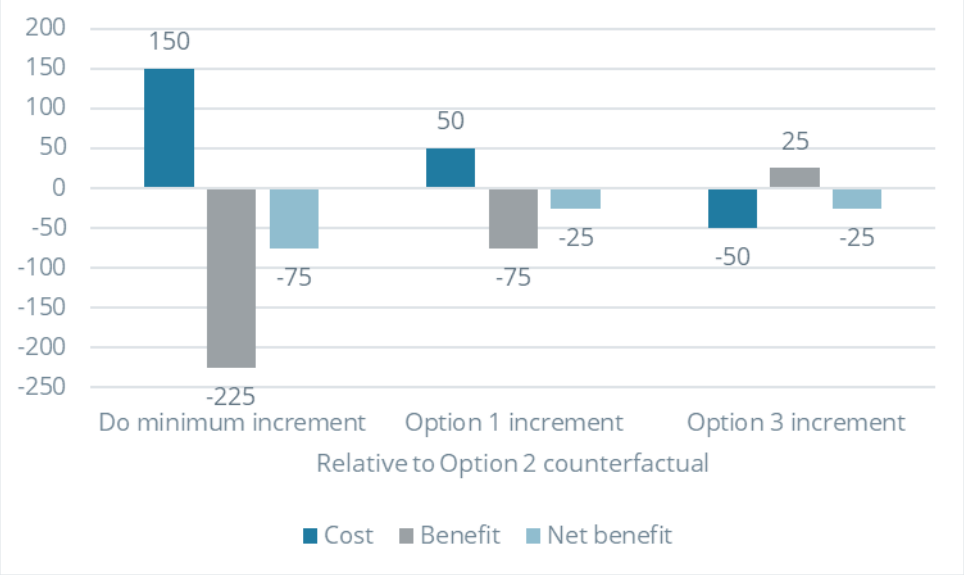
The following graph illustrates the incremental impacts of the three options compared to a 'do nothing' counterfactual. Option 2 would be the preferred option with the highest net benefit.



The following graph details the incremental impacts of the three options compared to a 'do minimum' base case. Option 2 remains the preferred option. It still has the highest net benefit as the change in base case impacts the incremental costs and benefits of the options symmetrically.



Now suppose that, for whatever reason, Option 2 is defined as the counterfactual. The below graph illustrates this scenario. In this instance all the options have a negative net benefit compared to the counterfactual and hence the counterfactual (Option 2) would be the preferred option.



While this example is hypothetical, the conclusions can be generalised except for the special cases where the either the 'do nothing' scenario or the 'do minimum' scenario is more net beneficial than the options tested.

Source: Frontier Economics

An alternative interpretation is that, while the same ranking of options would have obtained, the counterfactual adopted by Ergon Energy resulted in the net benefits of the preferred option being overstated. In other words, the AER's recommended counterfactual would have still identified Ergon Energy's preferred option as the most optimal one, but the estimated net benefits of that option would have been lower than the net benefits presented in Ergon Energy's proposal.

That interpretation does not withstand scrutiny either, at least in the case of pole replacements. The counterfactual scenario adopted by Ergon Energy assumed 16,622 pole replacements each year, and the preferred option identified by Ergon Energy's cost benefit analysis involved 18,622 annual pole replacements. We understand that the AER has indicated to EQL that a counterfactual scenario that assumes approximately 8,000 pole replacements per annum (in line with the replacement activity that occurred over the 2015-20 regulatory control period) would be more appropriate. If that scenario were adopted as the counterfactual, then:

- The preferred option for pole replacement would still involve 18,622 annual pole replacements; and
- The NPV of that option, relative to the new counterfactual of 8,000 pole replacements per year would be higher, not lower.

In these circumstances, Ergon Energy's choice of counterfactual would have understated (rather than overstated) the net benefits of the preferred pole replacement option.

Therefore, it was incorrect for EMCa to conclude that Ergon Energy's definition of counterfactuals "biases" the DNSPs' selection of repex options.[12]

[12] See, for example, EMCa, Ergon Energy 2025/26 to 2029/30 Regulatory Proposal, Review of Aspects of Proposed Expenditure, Public Version, August 2024, p. 28.

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