# An interim guidance note on emissions reduction

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AUSTRALIAN ENERGY REGULATOR

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# 1 Introduction

The Australian Energy Regulator (AER) exists to ensure energy consumers are better off, now and in the future. Consumers are at the heart of our work, and we focus on ensuring a secure, reliable and efficient energy future for Australia as it transitions to net zero emissions.

The National Electricity Law (NEL) and National Gas Law (NGL) require us to perform our economic regulatory functions in a manner that will, or is likely to, contribute to the achievement of the National Electricity Objective (NEO) and the National Gas Objective (NGO).[1]

These objectives guide our work to promote the long-term interests of consumers with respect to price, safety, reliability, quality, and security for the supply of electricity and covered gas, and with respect to contributing to the achievement of emission reduction targets for Australia's greenhouse gas emissions.

The NEO and the NGO place an overarching requirement on us to make revenue and access arrangement determinations that will deliver efficient outcomes to the benefit of energy consumers in the long term. The revenue and pricing principles support the NEO and the NGO, and provide a framework for efficient network investment.[2]

We are required to weigh emissions reduction alongside the other elements set out in the NEO and the NGO (e.g. price and reliability), meaning that the emissions reduction element is not intended to sit above or be prioritised above the other elements.[3] Necessarily, this requires us to exercise regulatory judgement in our assessments, based on the specific information before us and the relevant merits of the matter.

The National Electricity Rules (NER) require us to develop and publish guidelines, including the Cost Benefit Analysis Guideline, Regulatory Investment Test Guidelines, and the Expenditure Forecast Assessment Guideline. These statutory guidelines are supplemented by guidance notes to provide more granular and targeted information to stakeholders on how we will apply certain assessment approaches for certain expenditure drivers.

This emissions reduction guidance note aims to provide specific information to stakeholders on our expectations for expenditure forecasting, and the factors we would consider in assessing the emissions reduction component as part of the capital expenditure (capex) and operating expenditure (opex) objectives for electricity,[4] and new capital expenditure criteria for gas.[5]

The guidance note is non-binding, and we may update it from time-to-time as needed.

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1 NEL, s 16(1)(a); NGL s 28(1)(a).
2 NEL, s 7A; NGL s 24.
3 AER, *Final decision and explanatory statement – Expenditure Forecast Assessment Guidelines, October 2024*, p. 13.
4 NER cll. 6.5.6(a), 6.5.7(a), 6A.6.6(a) and 6A.6.7(a).
5 NGR, cl. 79.

## 1.1 Amended national energy objectives

Following assent being given to the *Statutes Amendment (National Energy Laws) (Emissions Reduction Objectives) Act 2023* (the Act),[6] a new emissions reduction element was added to the NEO and the NGO.[7] The Australian Energy Market Commission (AEMC) also published a targets statement that lists jurisdictional targets to be considered.[8] The long-term interests of consumers now includes the achievement of Commonwealth, State and Territory targets for:

- reducing Australian's greenhouse gas emissions, or
- actions that are likely to contribute to reducing Australia's greenhouse gas emissions.

On 1 February 2024, the AEMC published its final determination to harmonise the NER and the NGR with the updated energy objectives.[9] The final harmonising rule change supports the incorporation of emissions reduction in the energy regulatory framework. This rule requires us to:

- consider expenditure as part of building block proposals that contributes to achieving emissions reduction targets through the supply of prescribed transmission services, standard control services, and gas pipeline services (regulated services).
- update the guidelines and instruments, required under the Laws or Rules, to incorporate the amended national energy objective, including the changes to the capital and operating expenditure objectives.

In giving effect to this rule change, we updated our Expenditure Forecast Assessment Guideline, Cost Benefit Analysis Guideline, and Regulatory Investment Test Guideline for Transmission and Regulatory Investment Test Guideline for Distribution, in 2024.

## 1.2 Guidance note purpose and relationship to other AER documentation

This emissions reduction guidance note provides specific information to stakeholders on our expectations for expenditure forecasting, and the factors we will consider in assessing the emissions reduction component of expenditure proposals.

The guidance note takes a principle-based approach, and covers topics related to standard control services for both electricity and gas expenditure, as well as related matters such as tariffs and alternative control services (e.g. public lighting).

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6 Statutes Amendment (National Energy Laws) (Emissions Reductions Objectives) Act 2023.

7 See, for example, National Electricity Law, section 7.

8 AEMC, *Emissions targets statement under the national energy laws*, April 2025.

9 AEMC, *Final determination, National Electricity Amendment (Harmonising the national energy rules with the updated energy objectives) Rule 2024 National Gas Amendment (Harmonising the national energy rules with the updated energy objectives) Rule 2024 National Energy Retail Amendment (Harmonising the national energy rules with the updated energy objectives) Rule 2024*, 1 February 2024.

It should be read in conjunction with the Expenditure Forecast Assessment Guideline and the Better Resets Handbook when developing proposals that incorporate emissions reduction.[10] Where relevant, the emissions reduction guidance note should also be read in conjunction with other AER's expenditure-related documents, such as the:

- Cost benefit analysis guideline[11]
- RIT-T and RIT-D application guideline[12]
- Valuing emissions reduction – final guidance and explanatory statement[13]
- AER capex assessment outline for electricity distribution determinations[14]
- Non-network ICT capex assessment approach for electricity distributors[15]
- Distributed energy resource integration expenditure guidance note,[16]
- Note on the key issues of network resilience,[17] and
- Industry practice application note - asset replacement planning.[18]

Proposals relating to emissions reduction expenditure should clearly show how the expenditure aligns with the relevant existing guidelines and guidance documents, as well as this guidance note.

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10 AER, *Final decision, Expenditure Forecast Assessment Guideline – Electricity Distribution*, October 2024; AER, *Final decision, Expenditure Forecast Assessment Guideline – Electricity Transmission*, October 2024; AER, *Better Resets Handbook*, July 2024.

11 AER, *Cost benefit analysis guideline – 2024 – version 3*, November 2024.

12 AER, *Regulatory Investment Test for Transmission application guidelines – 2024 – Version 6*, November 2024; AER, *Regulatory Investment Test for Distribution application guidelines – 2024 – Version 6,* November 2024.

13 AER, *Valuing emissions reduction – Final guidance and explanatory statement*, May 2024.

14 AER, *capex assessment outline for electricity distribution determinations*, February 2020.

15 AER, *Guidance Note – Non-network ICT capex assessment approach for electricity distributors*, November 2019.

16 AER, *Final DER integration expenditure guidance note*, June 2022.

17 AER, *Network resilience – note on key issues*, April 2022.

18 AER, *Industry practice application note Asset replacement planning*, July 2024.

# 2 Principles for assessing emissions-related expenditure

This section sets out the general principles for assessing emissions reduction related expenditure and tariff proposals for regulated services. The 3 emissions reduction principles are:

- expenditure should be related to regulated services
- businesses should ensure ongoing and open engagement with consumers
- businesses need to demonstrate both relevance and materiality.

Our intention is to provide businesses with general guidance, while still allowing for flexibility in emissions reduction expenditure proposals. As this guidance note operates alongside our existing regulatory guidelines and guidance notes, businesses are still required to provide justification and cost benefit analyses for the proposed expenditure, as outlined in those various guidance documents, where relevant.

## Expenditure should be related to regulated services

The changes to the capital and operating expenditure objectives enable us to consider expenditure that contributes to meeting emissions reduction targets. When proposing emissions reduction expenditure, the business must establish that capital expenditure or operating expenditure is required to provide a regulated service.[19] Accordingly, we consider the expenditure proposed for meeting emissions reduction targets must be related to: [20]

- standard control services for distribution network service providers
- prescribed transmission services for transmission network service providers
- pipeline services for gas service providers.

Alternative / ancillary services are discussed in a separate section below.

As per the Expenditure Forecast Assessment Guidelines, we will utilise several assessment techniques when forming a view on the reasonableness of any proposed expenditure that contributes to emissions reduction targets.[21] We will assess how proposed investments contribute to reducing emissions, including consideration of where proposed investments may lead to a material increase in emissions.

## Businesses should ensure open and ongoing engagement with consumers

High quality consumer engagement is essential for ensuring that networks provide the services that meet the needs of their consumers, at a price that is efficient.

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19 AEMC, *Harmonising the rules with updated objectives*, February 2024, pp. 29–30.

20 NER cll. 6.5.6(a)(5), 6.5.7(a)(5), 6A.6.6(a)(5) and 6A.6.7(a)(5); NGR cll. 79(1)(a) and 91(1).

21 AER, *Final decision, Expenditure Forecast Assessment Guidelines – Electricity* Distribution, October 2024, p. 11: AER, *Final decision, Expenditure Forecast Assessment Guidelines – Electricity* Distribution, October 2024, p. 11.

Consistent with the Better Resets Handbook, our expectations on consumer engagement are principles-based, and do not prescribe any particular form or model of consumer engagement. They cover the following: [22]

- nature of engagement,
- the breadth and depth, and
- clear and evidenced impact of this engagement.

The nature of engagement is about how businesses engage with their consumers. This includes being open to new ideas and feedback, while ensuring consumers have the knowledge to make informed decisions. For emissions reduction, this may often require the adoption of new approaches, including cases where the preferred project option may come at a higher cost than if emissions reduction was not considered. This type of scenario emphasises the importance for businesses to engage in a transparent manner, including through information on the cost impact and how they expect to deliver the proposed outcomes. By conducting this engagement, this gives us more confidence that the preferred option will reflect consumers' long-term interests.

Breadth and depth relate to the scope of engagement with consumers, and the level of detail at which network businesses engage on issues. The breadth and depth of engagement also covers the variety of avenues used to engage with consumers. This may include providing outlines and timeframes for engagement, as well as allowing for multiple channels of communication. Further, as the benefits of emissions reduction may not be immediately evident during the regulatory period, it may therefore be important to explain the longer-term impacts of proposals, including ongoing engagement to allow consumers to be aware of any changes that may affect outcomes over time.

Clearly evidenced impact details how a proposal represents consumer views. Emissions reduction is an area that affects all Australians, and thus proposals should be accessible for wide comment. This can include releasing the draft regulatory proposal for stakeholder submissions, or the inclusion of an independent consumer report that sets out consumer perspectives. Proposals should demonstrate that stakeholders were clearly aware of the benefits, risks, and trade-offs of a business's emissions reduction expenditure. This can include highlighting direct and indirect benefits, such as the price and service impacts the proposed expenditure will have on the network's current and future consumers, or the wider community.

### Businesses need to demonstrate both relevance and materiality

For expenditure proposals, we will consider the emissions reduction component if the network has demonstrated that the proposed costs and emissions are both relevant and material. Similarly to our Cost Benefit Analysis Guideline, networks may include all Scopes of emissions that are material and relevant, where they consider there are appropriate data and methodologies to do so.[23] When including emissions, the changes in emissions should be:

- the direct result of the investment options

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22 AER, *Better Resets Handbook*, July 2024, pp. 11–15.
23 AER, *Cost benefit analysis guideline – 2024 – Version 3*, November 2024, p. 26.

- only included to the degree that those emissions reductions are a result of the network investments
- estimated using an appropriate approach and data.

### Alternative / ancillary services

While not explicitly considered in the AEMC's rule change, there may be cases where a business proposes alternative control / ancillary services with expenditure that contributes to meeting emissions reduction targets. In such cases, we consider the principles set out above should also apply in our assessment of alternative / ancillary proposals.

We consider businesses must specifically demonstrate how they meet the principles below when proposing alternative / ancillary service expenditure related to emissions reduction:

- Relevance and materiality — alternative / ancillary services are discrete and highly variable services paid for by the customer requesting the service. Customers may request specific services on an infrequent basis. Businesses must therefore demonstrate that any emissions reduction benefits from providing alternative / ancillary services are material enough to contribute to emissions reduction targets. For example, it may relate to more common / frequently used alternative / ancillary services.
- Engagement with consumers — businesses must demonstrate customer demand and support for the specific service, including proposed price increases (to which expenditures related to emissions reductions are inputs). This should include demonstration that consumers understood the costs and benefits of the proposed emissions reduction expenditure.
- Costs and benefits should be considered — proposals for alternative / ancillary services have generally not included detailed cost-benefit analysis or options analyses. However, cost-benefit and options analysis may become more important in the future, where businesses propose expenditure for alternative / ancillary services that contributes to meeting emissions reduction targets. For example, we may require such analysis where an expenditure program contributes to the provision of a suite of alternative / ancillary services that proposes replacing its vehicle fleet with electric vehicles, or using more energy efficient technologies. Businesses are encouraged to engage with us ahead of making any such proposals.

# 3 Implementation issues for assessing emissions-related expenditure

This section sets out implementation issues relevant to our assessment of the prudency and efficiency of emissions reduction expenditure and proposals. In particular, this section provides guidance on:

- the Scope of emissions (direct and indirect)
- the use of discount rates and applying a value of emissions reduction
- the AEMC's target statement and other emissions reduction policies
- emissions reduction expenditure proposals
- emissions accounting and benefit streams
- interactions with incentive schemes and other government policies
- post-implementation reviews
- tariff structures.

## Scope of emissions

We will consider the Scope of emissions consistent with our approach set out in the Cost Benefit Analysis Guideline.[24]

When calculating the benefit from changes in Australia's greenhouse gas emissions, businesses should:

- include all relevant and material emissions, including Scope 1, Scope 2 and Scope 3 emissions[25]
- estimate the change in annual emissions between the base case and the proposed options, and then multiply this change by the Value of Emissions Reduction (VER) to arrive at the annual emissions reduction benefit.

When considering the Scopes of emissions, the changes in emissions should:

- be the direct result of the investment options
- only be included to the degree that the emissions are a result of the network investments
- be estimated using an accepted carbon accounting approach and data that meets the respective requirements and guidelines.

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24 AER, *Cost benefit analysis guideline – 2024 – Version 3*, November 2024, pp. 26–27.

25 Such as production and transmission of electricity or gas, consumption of electricity or gas, fugitive emissions from production of process inputs.

## Discount rate

Consistent with our approach set out in the Cost Benefit Analysis Guideline,[26] we expect businesses to use a discount rate to compare costs and benefits received at different points in time. The discount rate reflects the opportunity cost of cash flows associated with investments in terms of delays to consumption or alternative investment opportunities forgone.[27]

The discount rate should not be changed because of the inclusion of the changes in Australia's greenhouse gas emissions benefit. The discount rate also should not generally be used to manage uncertainty over predicted costs and benefits. This is because it is typically best practice to capture this uncertainty through sensitivity testing and scenario analysis, rather than through the choice of discount rate.[28]

We consider that the value of emissions reduction is an estimate of the marginal cost of carbon abatement that is consistent with national emissions targets in each year. It represents the additional cost of carbon abatement that emissions from a project impose elsewhere in the national economy to stay within the annual emissions budget. As the VER is a value that has effect in the same year as the corresponding emissions, our view is that the VER should be discounted in the same way as other project costs and benefits.

## AEMC target statement and other emissions reduction policies

As required by the NER,[29] we will consider all targets specified in AEMC's targets statement.[30] We will also have regard to other legislative and policy-based emissions reduction targets that are not in the AEMC's target statement, when relevant to providing regulated network services. In considering these other targets, we will apply our discretion by considering the factors set out below.

Our assessment will have regard to whether the proposal has adequately justified how the proposed expenditure will contribute to the achievement of the emissions reduction targets, including the:

- impact to the emissions reductions profile compared to the base case
- level of certainty surrounding the emissions reductions
- materiality of the emissions reductions and their relevance for contributing to the targets
- relevance of the targets to regulated services.

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26 AER, *Cost benefit analysis guideline – 2024 – Version 3*, November 2024, pp. 11–12.

27 Department of the Prime Minister and Cabinet Office of Best Practice Regulation, *Guidance note: Cost benefit analysis*, February 2016, pp. 5-6; Productivity Commission, *Valuing the future: the social discount rate in cost-benefit analysis*, April 2010, p. ix.

28 Productivity Commission, *Valuing the future: the social discount rate in cost-benefit analysis*, April 2010

29 NER, cls 6A.6.7(a)(5) and 6.5.7(a)(5) in reference to capital expenditure criteria.

30 AEMC, *Targets statement for greenhouse gas emissions*, June 2024. Please note, the AEMC will periodically consider whether jurisdictions have set new or revised targets which need to be reflected in the targets statement.

We expect businesses to be transparent and show how the proposals relate to these factors. This will allow us to appropriately assess whether the proposed emissions reductions-related costs are prudent and efficient.

### Emissions reduction expenditure proposals

Consistent with our current assessment approach, we expect emissions reductions related expenditure to be supported through a business case (with the exception of alternative/ancillary services). We will have particular regard to the relevance and transparency of both the qualitative and quantitative analysis in support of the proposed emissions related expenditure. Our assessment will:

- consider how the business has justified the project need, and how it is relevant to providing regulated services
- have regard to whether the benefits of the expenditure (including the stated benefits) outweigh the cost of the proposed investment
- assess how all options have been considered in the business case, at minimum, including the business-as-usual, or base case option, and the alternative investment options, including how non-network solutions have been considered
- have regard to the timeframe, including when the benefits of the proposed option will be realised and the degree of certainty of these benefits
- have regard to double counting of emissions and benefits across investments.

Additionally, we will have regard to the alignment of the proposal and the business' sustainability or climate change policy, including evidence of the business's capacity and expertise to deliver the stated aim.

### Emissions accounting and benefit streams

We consider it important that proposals are justified through the application of appropriate inputs and assumptions. Our assessment will therefore have regard to whether the sources of all inputs and assumptions are provided and are consistent with relevant guidance and any statutory obligations. This includes the data sets and methodologies used to estimate the relevant and material emissions.

For instance, businesses may support their proposals using relevant inputs and methodologies consistent with the *National Greenhouse and Energy Reporting (Measurement) Determination 2008*,[31] or the Department of Climate Change, Energy, the Environment and Water's *National Greenhouse Accounts (NGA) Factors*.[32] We will have regard to, and may require evidence, of the alignment with these accounting methodologies and processes. Where a business develops its own or bespoke process, we expect it to provide supporting information on the chosen approach, inputs and assumptions. This should

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31 *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Cth) a legislative instrument made under subsection 10(3) of the *National Greenhouse and Energy Reporting Act 2007* (Cth).

32 Department of Climate Change, Energy, the Environment and Water, *Australian National Greenhouse Accounts Factors*, 2024. Please note, this National Greenhouse Accounts (NGA) Factors are updated from time to time. These NGA factors are made in accordance with the Department's National Greenhouse and Energy Reporting Scheme.

describe the relevance and basis of the selected emissions boundary or emissions factors, where appropriate.

Overall, we consider that the quantity of forecast emissions reduction, for the respective emissions reduction expenditure, will be the difference between the *business-as-usual* option and any alternative emissions reductions options, over the assessment period.

The cost benefit analysis will convert this quantity of emissions reduction for each option into monetary terms to estimate the benefit stream associated with the emissions reduction element. That is, the annual projected emissions reduction should be multiplied with the corresponding year's VER. The VER is specified in our *Valuing emissions reduction final guidance.*[33]

Importantly, the proposed expenditure must have a justified need and must be related to the provision of regulated services. Our cost benefit assessment is based on the overall assessment of all benefits and costs, rather than on emissions reduction benefits alone, in order to assess the relative efficiency of different options. We must be satisfied that the proposed expenditure is prudent and efficient.

We further expect symmetry to be applied across the options, with the VER represented as either a positive or negative benefit. The VER is not intended to be used as a cost input.[34] We also expect the same discount rate to apply to both the emissions and monetary aspects of the cost benefit analysis.[35]

### Interactions with incentive schemes and other government policies

Emissions reduction expenditure may interact broadly across various incentive schemes or other government policies. For instance, policies that provide for rewards to businesses that achieve certain target levels or emissions reduction.

To meet the capital and operating expenditure objectives, we expect businesses to account for the interactions with incentive schemes and other government policies.[36]

In assessing the emissions reduction expenditure, we must be satisfied that a business has:

- identified the interactions with other schemes and grants that are relevant to emissions reduction
- accounted for any benefits received from other schemes and grants before proposing the expenditure
- demonstrated how any realised rewards are appropriately shared with consumers.

Businesses will need to provide relevant supporting evidence demonstrating that the above points have been accounted for in proposals.

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33 AER, *Valuing emissions reduction – Final guidance and explanatory statement*, May 2024.
34 AER, *Cost benefit analysis guideline – 2024 – Version 3*, November 2024, p. 12.
35 AER, *Cost benefit analysis guideline – 2024 – Version 3*, November 2024, p. 11.
36 NER, cll. 6A.6.7(e)(8) and 6.5.7(e)(8) in reference to capital expenditure factors.

## Post-implementation reviews

We recommend conducting post-implementation reviews (PIR) and sharing the outcomes in a public domain. This is important as emissions reduction is a new area of assessment and there are likely significant opportunities for capturing learnings through implementation.

We consider that PIRs for emissions reduction related expenditure will improve transparency in investments, and improve the sector's understanding, including our toolkit, for assessing the benefits of emissions reduction expenditure. By providing PIRs, the businesses can further evidence the extent to which it can deliver the benefits of emissions reduction expenditure. This may also help with justifying future proposals.

We also consider that it is good industry practice that PIRs include benefit assessment. This enhances transparency, particularly as the benefits from an emissions reduction related investment may be realised over a long period post implementation. We consider that the businesses are in the best position to assess and forecast future benefits after the investment is implemented and operational.

## Tariff structures

When we assess network tariff proposals submitted to us by electricity distributors, we are required to assess their compliance with the distribution pricing principles, and other applicable requirements of the NER.[37] We are *also* required to make decisions on network tariffs in a manner that will, or is likely to, contribute to the achievement of the NEO. In doing so, we want to see alignment between new network infrastructure investment and network price signals, to facilitate the most efficient use of existing assets and to reduce the need for asset base growth.

When making our decisions on network tariff proposals, we balance the price efficiency element and the emissions reduction element of the updated NEO. It is often not a case of trading efficiency for emissions reductions. Rather, the two considerations tend to be mutually reinforcing in tariff design.

There is currently strong alignment between efficient price signals and maximising the use of renewable energy. This is due to Australia's electricity generation mix and the times of day at which different sources of electricity dominate our market.

For example, at midday, networks are flooded with rooftop solar. To match, network tariffs increasingly have very low prices in the midday period. These 'solar soak' tariffs incentivise use of electricity in the midday period, which increases the amount of solar that can be exported to the grid. That is, they reduce the likelihood of export constraints.

Peak period charges, applied to residential customers in the late afternoon and early evening, and intended to signal when energy use drives network costs, match the time of day when solar electricity declines and fossil fuel generation dominates. By imposing higher prices in the peak period, network tariffs incentivise less electricity use from fossil fuel generators.

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37 NEL, s. 16(2).

Further, export reward tariffs can pay customers for exporting electricity from their own rooftop solar or battery onto the grid in the evening peak period. Again, more evening exports will help to substitute fossil fuel electricity with rooftop solar exports, even when the sun isn't shining.

By applying a small charge to some rooftop solar exports in the midday period, export reward tariffs incentivise self-consumption or storage, and recover network costs in a fairer way, from consumers using the network for their exports.

Our consideration of electricity distribution network tariff proposals accounts for the above considerations, but also gives weight to the circumstances of individual distribution networks and to the views of stakeholders. It is also premised on a general position that for efficient investment and use of the network in the long-term interests of all consumers, all distribution customers should contribute to recovery of costs from the network services they use.

**Gas distribution network tariffs**

Gas distribution network tariffs for haulage (gas transportation) services have a declining block structure. That is, for an initial volume, or "block", of gas transported, haulage charges are set relatively high. For each subsequent block of gas transported, haulage charges incrementally step down. The final block of transported gas has the lowest per unit charge. There are typically between 3 and 6 blocks within a single declining block tariff.

Declining block tariffs provide a weakening incentive for gas customers to mitigate their gas use, as their gas use increases. While this tariff structure is beneficial for customers using lots of gas, it does not align well with the updated NGO with its new emissions reduction element.

We reviewed gas distribution network tariff structures, through a public process, in 2023. We undertook the review for several reasons. First, because of stakeholder feedback that declining block tariffs are inappropriate. Second, the announcement by Energy Ministers that the NGO would be amended to incorporate an emissions reduction element. And third, because of the establishment by some states and territories of policies encouraging gas customers to switch to electricity.

Having released an issues paper, held a well-attended online public forum and having considered a number of written submissions, we released a final decision in October 2023. Our final decision noted we will consider these issues on a case-by-case basis in the context of individual access arrangement reviews. In this way we can account for the differing levels of reliance on natural gas as an energy source across different jurisdictional markets, different policy settings applicable in each of those markets, and the views of distributor-specific stakeholders.

In each case we are taking account of different potential bill impacts from tariff changes and the differences between volume and demand (large) customer groups. Some customers will be better able to respond to new tariff structures, in addition to seeing varying bill impacts, depending on their level of gas use.

We will continue to assess gas network tariff structures in light of the updated NGO, with a view to balancing economic efficiency considerations, emissions reduction targets, and the

different policy settings under which gas networks provide services in different states and territories.

# 4 Illustrative examples of emissions reduction expenditure

This section provides some worked example guidance on calculating the emissions reduction benefits. In particular, we describe the approach to estimate the base case scenario. The options analysis compares the proposed scenarios to the base case, to calculate the outcomes for the respective options. We provide illustrative examples for the following scenarios:

- decrease in emissions from a replacement generator
- decrease in emissions from Sulphur Hexafluoride
- increase in emissions from a mobile generator
- decrease in emissions from increased CER exports
- decrease in emissions from line losses
- decrease in emissions from connecting a biomethane plant.

## Methodology for calculation emission reduction benefit streams

We would expect the following general methodology to apply to estimate the emissions reduction benefit stream for expenditure proposals:

$$Benefit_t = VER_t \times (base\ case\ emissions_t - investment\ case\ emissions_t)$$

Where:

$$Benefit_t = \text{the monetary benefit for year t}$$
$$VER_t = \text{Value of Emissions Reduction for year t}$$
$$base\ case\ emissions_t = \text{total estimated emissions for the base case option in year t}$$
$$investment\ case\ emissions_t = \text{total estimated emissions for the respective scenario in year t}$$

Note that calculating emissions varies depending on the accounting methodology used and on the emissions source.

The following examples show a breakdown in the application of the key elements in this methodology under different expenditure scenarios.

**Example 1 – Decrease in emissions from a replacement generator**

The business has identified a need to replace an existing diesel generator to support the operation of the network. The business case's options analysis identified a renewable solution as an alternative option. [38]

[38] Department of Climate Change, Energy, the Environment and Water, *National Greenhouse Account Factors 2024*, August 2024.

*Assumptions*

| Assumptions | Value |
|---|---|
| **Consumption** | $1.1\ kL/day$ |
| **Days per week** | 4 |
| **Weeks per year** | 35 |
| **Diesel energy content** | $38.6\ GJ/kL$ |
| **Diesel emission content** | 87.5 kg $CO_{2-e}/GJ$ |
| **Renewable option emission content**[39] | 0 t $CO_{2-e}$ |
| **VER$_{2024}$**[40] | $\$70/t\ CO_{2-e}$ |

*Calculation*

$$Diesel\ emissions_{2024} = \frac{(1.1\ kL \times 4\ days \times 35\ weeks) \times 38.6\ GJ/kL \times 87.5\ kg\ CO_{2-e}/GJ}{1000}$$

$$Diesel\ emissions_{2024} = 520.1t\ CO_{2-e}$$

$$Renewable\ emissions_{2024} = 0tCO_{2-e}$$

$$Benefit_{2024} = \$70/t\ CO_{2-e} \times (520.1\ t\ CO_{2-e} - 0\ t\ CO_{2-e})$$

$$Benefit_{2024} = \$36{,}409$$

The above example illustrates that annually, 520.1 t $CO_{2\text{-}e}$ would be avoided with the renewable option, with an associated annual benefit of $36,409.

**Example 2 – Decrease in emissions from Sulphur Hexafluoride**

The business has identified the need to upgrade a substation. As part of the upgrade, the business needs to re-gas the switchgear. Currently, Sulphur hexafluoride ($SF_6$) is used as the insulating medium. The base case will involve initial degassing, and subsequent re-gassing of $SF_6$ as the insulating medium.[41] The business has also identified new technology that reduces the annual leakage rate from 5% to 1%.[42] As a part of the justification, the business is considering the emissions reduction benefit.

39 Systems receiving Large-scale Generation Certificates under the Renewable Energy Target are required to retain / surrender the respective certificates.

40 For simplicity, the examples assume no conversion to real terms.

41 $SF_6$ is maintained as the medium for illustrative purposes.

42 Assume full year of leakage.

*Assumptions*

| Assumptions | Value |
|---|---|
| **$SF_6$ mass** | $250kg, pre\ and\ post\ works$ |
| **$SF_6$ captured/reused** | $60\%$ |
| **Leakage rate** | $base\ case: 5\%$<br>$alternative\ case: 1\%$ |
| **Global warming potential**[43] | $23{,}500\ CO_{2-e}$ |
| **$VER_{2024}$** | $\$70/t\ CO_{2-e}$ |
| **$VER_{2025}$** | $\$75/t\ CO_{2-e}$ |

*Calculation*

Base case

$$emissions_{2024} = (0.25t \times 23{,}500\ CO_{2-e}) \times (100\% - 60\%) + (0.25t \times 5\% \times\ 23{,}500\ CO_{2-e})$$
$$= 2{,}644t\ CO_{2-e}$$
$$emissions_{2025} = 0.25t \times 5\% \times 23{,}500\ CO_{2-e}$$
$$= \ 294t\ CO_{2-e}$$

Alternative case

$$emissions_{2024} = (0.25t \times 23{,}500\ CO_{2-e}) \times (100\% - 60\%) + (0.25t \times 1\% \times\ 23{,}500\ CO_{2-e})$$
$$= 2{,}409t\ CO_{2-e}$$
$$emissions_{2025} = 0.25t \times 1\% \times 23{,}500\ CO_{2-e}$$
$$= \ 59t\ CO_{2-e}$$

Using the differences in emissions above, the net benefit for emissions reduction is:

$$Benefit_{2024} = \$70/t\ \ CO_{2-e} \times (2{,}644\text{t}\ CO_{2-e} - 2{,}409t\ CO_{2-e})$$
$$Benefit_{2024} = \$16{,}450$$

$$Benefit_{2025} = \$75/t\ \ CO_{2-e} \times (294\text{t}\ CO_{2-e} - 59t\ CO_{2-e})$$
$$Benefit_{2025} = \$17{,}625$$

The above example illustrates that the base case scenario results in 2,644t $CO_{2\text{-}e}$ of emissions for the first year, with subsequent years' annual emissions of 294t $CO_{2\text{-}e}$. Meanwhile, the alternative option results in 2,409 t $CO_{2\text{-}e}$ of emissions for the first year, with

[43] The Global Warming Potential is a factor to convert the relevant greenhouse gas to carbon dioxide equivalent. See Department of Climate Change, Energy, the Environment and water, *National Greenhouse Account Factors 2024*, August 2024, p. 47.

subsequent annual emissions of 59 t $CO_{2\text{-}e}$. The total net annual emissions reduction benefit for this option is $16,450 in 2024 and $17,625 in 2025.

**Example 3 – Increase in emissions from mobile generator**

A network has identified frequent network outages and has proposed using a mobile diesel generator to improve restoration times for customers during an extended outage. While the use of mobile diesel generator has a positive value of customer reliability, business should also take emissions into account.

For clarity, in this scenario we need to consider the VER in addition to the VCR benefit.

*Assumptions*

| Assumptions | Value |
|---|---|
| **Time in use** | $300\ hours\ per\ year$ |
| **Energy load** | $0.4\ MW$ |
| **Diesel energy content** | $38.6\ GJ/kL$ |
| **Diesel emission content** | $87.5\ kgCO2_{-e}/GJ$ |
| **Energy conversion** | $0.5kL\ /MWh$ |
| **Value of emission reduction$_{2024}$** | $\$70/t\ CO_{2-e}$ |

*Calculation*

$$\text{Mobile generator emission}_{2024} = 0.4MW \times 300hours \times 0.5kL/MWh \times 38.6GJ/kL \times 87.5kg\ CO_{2-e}/GJ$$
$$= -202.7t\ CO_{2-e}$$
$$Mobile\ generator\ benefit_{2024} = \$70/t\ \ CO_{2-e} \times -202.7t\ CO_{2-e}$$
$$= -\$14{,}189$$

This example illustrates how emissions increases should be considered in the business case. The impact of the mobile generator is to increase the associated emissions, subsequently resulting in a $14,189 associated negative benefit for 2024.

**Example 4 – Decrease in emissions from increased CER exports**

The business has proposed expenditure associated with integrating additional CER and allowing increased CER exports. Emissions reduction is one of the benefit streams identified. For the cost-benefit analysis, the business may use both our published customer export curtailment values (CECV) to estimate the benefit arising from the CER, and to further quantify the relevant emissions reduction from this CER export. The recent 2024 CECV update includes state-specific emissions intensity forecasts for each half hour over a 20-year

period.[44] Table 1 shows an example of the data from the CECV update and illustrates the approach to estimate the emissions reduction over 4 intervals in 2026 using the published emissions intensity values. For simplicity, assume a constant and fixed generation and export profile of 1 MW, with an emission intensity of 0 t $CO_{2\text{-}e}$ / MWh.

Table 1: Emissions reduction and CECV benefit – 1 MW in NSW, 12 November 2026

| Interval | Network intensity (t $CO_{2\text{-}e}$/MWh) | Export intensity (t $CO_{2\text{-}e}$/MWh) | Total emissions reduction (t $CO_{2\text{-}e}$) | CECV ($/MWh) | Total CECV ($) |
|---|---|---|---|---|---|
| 12:00–12:30 | 0.0109 | 0 | 0.0054 | 0 | 0 |
| 12:30–13:00 | 0.0109 | 0 | 0.0054 | 0 | 0 |
| 19:00–19:30 | 0.9316 | 0 | 0.4658 | 45.58 | 22.79 |
| 19:30–20:00 | 0.9316 | 0 | 0.4658 | 45.58 | 22.79 |

The method in Table 1 may be replicated across the assessed period to calculate both the total quantity of emissions reduction and the respective CECV benefit. This total is shown in the following assumptions. Specifically, the emissions reduction values for 2026 and 2027 shown in the following assumptions are from the full table of data for the given time period over financial year 2026–27, which is not the sum of the 12 November 2026 data shown in Table 1. The calculated quantity of emissions reduction is then multiplied by the VER to estimate the associated monetary emissions reduction benefit.

*Assumptions*

| Assumptions | Value |
|---|---|
| **2026 emissions reduction from exports**[45] | 171.6 t $CO_{2-e}$ |
| **2027 emissions reduction from exports** | 160.2 t $CO_{2-e}$ |
| **Total CECV benefit**[46] | $19,371 |
| $\boldsymbol{Value\ of\ emission\ reduction_{2026}}$ | $80 / t $CO_{2-e}$ |
| $\boldsymbol{Value\ of\ emission\ reduction_{2027}}$ | $84 / t $CO_{2-e}$ |

44 AER, *Customer export curtailment methodology – Annual Adjustment*, 1 July 2024.

45 This is the total emissions reduction achieved by integrating an additional 1MW of CER during the above 4 interval each day of 2026–27 in NSW.

46 This is the total CECV benefit achieved by exporting 1 MWh during the above 4 intervals each day of 2026–27.

*Calculation*

$$Emissions\ reduction\ benefit_{2026\text{–}27}$$
$$= \$80/t\ CO_{2-e} \times 171.6t\ CO_{2-e} + \$84/t\ CO_{2-e} \times 160.2t\ CO_{2-e} = \$27{,}184$$

$$Total\ benefit_{2026\text{–}27} = \$27{,}184 + \$19{,}371 = \$46{,}555$$

The above example illustrates that the additional CER exports will result in an emissions reduction benefit of 331.8t $CO_{2\text{-}e}$. This has associated total (emissions reduction and CECV) benefit of $46,555 for this period.

**Example 5 – Decrease in emissions from line losses**

The business is required to replace the existing conductor and proposes additional expenditure for a conductor with 30% lower resistance. Emissions reduction is used to justify the additional costs, based on the expected reduction in line losses. To demonstrate the likely decreased losses, the business also submits detailed analysis on the load profiles and the impact on line losses with each scenario.

*Assumptions*

| Assumptions | Value |
|---|---|
| **Line losses – base case**[47] | 1,000 MWh |
| **Improvement in resistance losses** | 30% |
| $\boldsymbol{Value\ of\ emission\ reduction_{2024}}$ | $\$70/t\ CO_{2-e}$ |
| **Grid emission factor – Qld**[48] | $(0.71 + 0.1)tCO_{2-e}/MWh$ |

*Calculation*

$$Emissions_{2024} = 1{,}000\ MWh \times (30\%) \times 0.81\ \text{t}CO_{2-e}/MWh = 243tCO_{2-e}$$

$$Benefit_{2024} = \$70/t\ CO_{2-e} \times 243tCO_{2-e} = \$17{,}010$$

The above example illustrates that selecting the lower resistance conductor results in 300MWh of avoided line losses, with an associated benefit of $17,010.

**Example 6 – Decrease in emissions from connecting a biomethane plant**

The business is proposing to connect a biomethane plant to the gas distribution network in NSW (Metro). The gas produced by the biomethane plant will offset natural gas.

*Assumptions*

47 Based on detailed analysis of energy profile and conductor resistance.

48 Department of Climate Change, Energy, the Environment and water, *National Greenhouse Account Factors 2024, p. 9.*

| Assumption | Value |
|---|---|
| **Biomethane produced p.a.** | 1.5 TJ |
| **Emission factors for the consumption of Natural Gas (Scope 1)** | $51.53kg\ CO_{2-e}/\ GJ$ |
| **Indirect (Scope 3) emission factors for the consumption of natural gas (NSW Metro)** | $13.10kg\ CO_{2-e}/\ GJ$ |
| **Emission factor – biomethane gas consumption** | $0.13kg\ CO_{2-e}/\ GJ$ |
| **Value of emission reduction$_{2024}$** | $\$70/t\ CO_{2-e}$ |

*Calculation*

$$\text{Natural gas emissions}_{2024} = \frac{1.5TJ \times 1000 \times 64.63 \frac{kgCO_{2-e}}{GJ}}{1000} = 96.9t\ CO_{2-e}$$

$$\text{Biomethane emissions}_{2024} = \frac{1.5TJ \times 1000 \times 0.13 \frac{kgCO_{2-e}}{GJ}}{1000} = 0.2t\ CO_{2-e}$$

$$\text{Benefit}_{2024} = \$70/t\ CO_{2-e} \times (96.9t\ CO_{2-e} - 0.2t\ CO_{2-e}) = \$6{,}769$$

This example illustrates that displacing 1.5TJ per year of natural gas with biomethane will result in an associated benefit stream of $6,769.

# Shortened forms

| Term | Definition |
|---|---|
| AER | Australian Energy Regulator |
| AEMC | Australian Energy Market Commission |
| capex | capital expenditure |
| NEO | National Electricity Objective |
| NEL | National Electricity Law |
| NER | National Electricity Rules |
| NGL | National Gas Law |
| NGO | National Gas Objective |
| opex | operating expenditure |
| PIR | post-implementation reviews |
| VER | Value of Emissions Reduction |