EMBER

Submission to the Review of Australia's Coal Mine Waste Gas method

Analysis of the potential value of continuing Australia's Coal Mine Waste Gas method beyond 2025 and extending the existing methodology to include both underground and open cut mines.

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Submitted by: Christopher Wright
Contact: chris.wright@ember-climate.org

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About Ember

Ember is an independent, not-for-profit energy think tank that aims to accelerate the clean energy transition with data and policy. It gathers, curates and analyses data on the global power sector and its impact on the climate, using cutting edge technologies and making data and research as open as possible. It uses data-driven insights to shift the conversation towards high impact policies and empower other advocates to do the same. Founded in the UK in 2020, its team of energy sector analysts are based in Australia, the EU, Asia and the UK.

Acknowledgement of Country

Ember acknowledges the Traditional Custodians of the many nations across Australia and their enduring connection to Country and the lands, seas and skies. We pay our respects to Elders past and present and extend that respect to all Indigenous Peoples today.

Broader Context

The coal mine waste gas (CMWG) method has played a considerable role in accelerating what has been a considerably challenging decade on coal mine decarbonisation, and should be extended as a means of insuring a range of complimentary incentive opportunities for decarbonising the resource sector's biggest emissions sources.

Ember welcomes the opportunity to make a submission to the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW) regarding the review of the Coal Mine Waste Gas method (CMWG).

The coal mine waste gas (CMWG) method has played a significant role in incentivising mitigation of the coal sector since its inception in 2015. There are currently 15 registered projects that have led to the mitigation of 2.78 million tonnes of CO2-e. The majority of these projects are based in Queensland (10 projects) with a primary focus on electricity displacement utilizing fugitive methane gas at metallurgical coal mines that would otherwise be vented into the atmosphere or flared.

This is a particularly valuable contribution to decarbonising metallurgical coal, which will be critical for realising both state-wide and national emissions reduction goals over the next decade. This also highlights the coal mine waste gas (CMWG) method can and should play a complimentary role alongside upfront funding mechanisms such as the Powering the Regions fund and the Queensland Low Emissions Industry Program (LEiP) fund.

Both of these funds have announced upfront capex support for coal mine decarbonisation across three QLD facilities in the past year, but provide little in supporting the ongoing operational costs of long term mitigation. By providing a targeted support mechanism that incentivises ongoing methane capture and utilisation across the mining sector, the CMWG plays a valuable supplementary role that can and should continue to support decarbonisation long term. This is a role that Ember believes should be expanded to open cut mines, where project proponents at South Walker Creek and Curragh mines have already begun to explore mitigation and utilisation opportunities.

Additionally, there are three more electricity displacement and two flaring projects registered in New South Wales. This is a particularly valuable contribution to coal mine mitigation in NSW, where a number of financing mechanisms such as the COal Innovation fund and the

Net Zero Industry and Innovation Program have had relatively little impact on progressing material abatement at coal mines beyond initial feasibility assessments.

In 2023-2024, the Coal innovation fund progressed pilot VAM abatement trials at Appin coal mine to a feasibility study. However, following a 5 year feasibility program, it has yet to have a tangible impact on coal mine methane at the site. While there are hopes that the program will mature to full implementation this year, the Appin coal mine continues to have the highest emissions intensity of any coal mine in Australia (O.639 t CO2-e/ROMt). Similarly, the NSW Net Zero Industry and Innovation Program has sought to incentivise mitigation financing across coal mines since 2021, and has yet to fund a single abatement project in the state. This highlights the relative value of the CMWG as an incentive within the state.

However, we also believe the CMWG could be significantly expanded and improved upon through deeper stakeholder engagement. Currently the vast majority of mitigation opportunities under the CMWG have been taken up by EDL and its various sub-entities. Considering the limited diversity of entities that have been able to utilise the method to date, there is a clear need to broaden the engagement approach across the sector, and ensure that the incentive opportunities are well attuned to ensure the most efficient decarbonisation opportunities.

An example of the benefits of broader stakeholder engagement can be found in the landfill gas method. To date, this has 89 registered projects and has reduced 7.3 million tonnes of CO2-e and has benefitted greatly from broad stakeholder engagement and technical refinement. These stakeholder engagements include environmental agencies, scientific organizations, and landfill operators, through technical working groups that have helped refine the methodology and address operational challenges. This approach to broad, robust and continuous improvement could be integrated to the CMWG, especially as it seeks to expand into open cut mines, and navigate the regulatory boundaries of the Safeguard Mechanism going forward.

Overall, the coal mine waste gas method plays a crucial role in the broader emissions reduction landscape, complementing other established methods, regulator approaches and incentive schemes. This should be extended and expanded to incorporate open cut mines, flexibility to incorporate mitigation or displacement across multiple facilities, and a broadening of the stakeholder engagement opportunities for continuous refinement.

Specific Review Questions

1. The impact of regulatory and other changes since 2015 that may influence the additionality of new projects under the method:

Since 2015, there have been several regulatory changes in Australia that have sought to improve the measurement practices and incentivise decarbonisation of scope 1 emissions across particularly high emitting facilities. This most notably includes ongoing changes in the National Greenhouse and Energy Reporting (NGER) Scheme as well as the Safeguard Mechanism. Changes in the broader financing landscape across State and Federal schemes also raise important questions regarding the additionality of the CMWG.

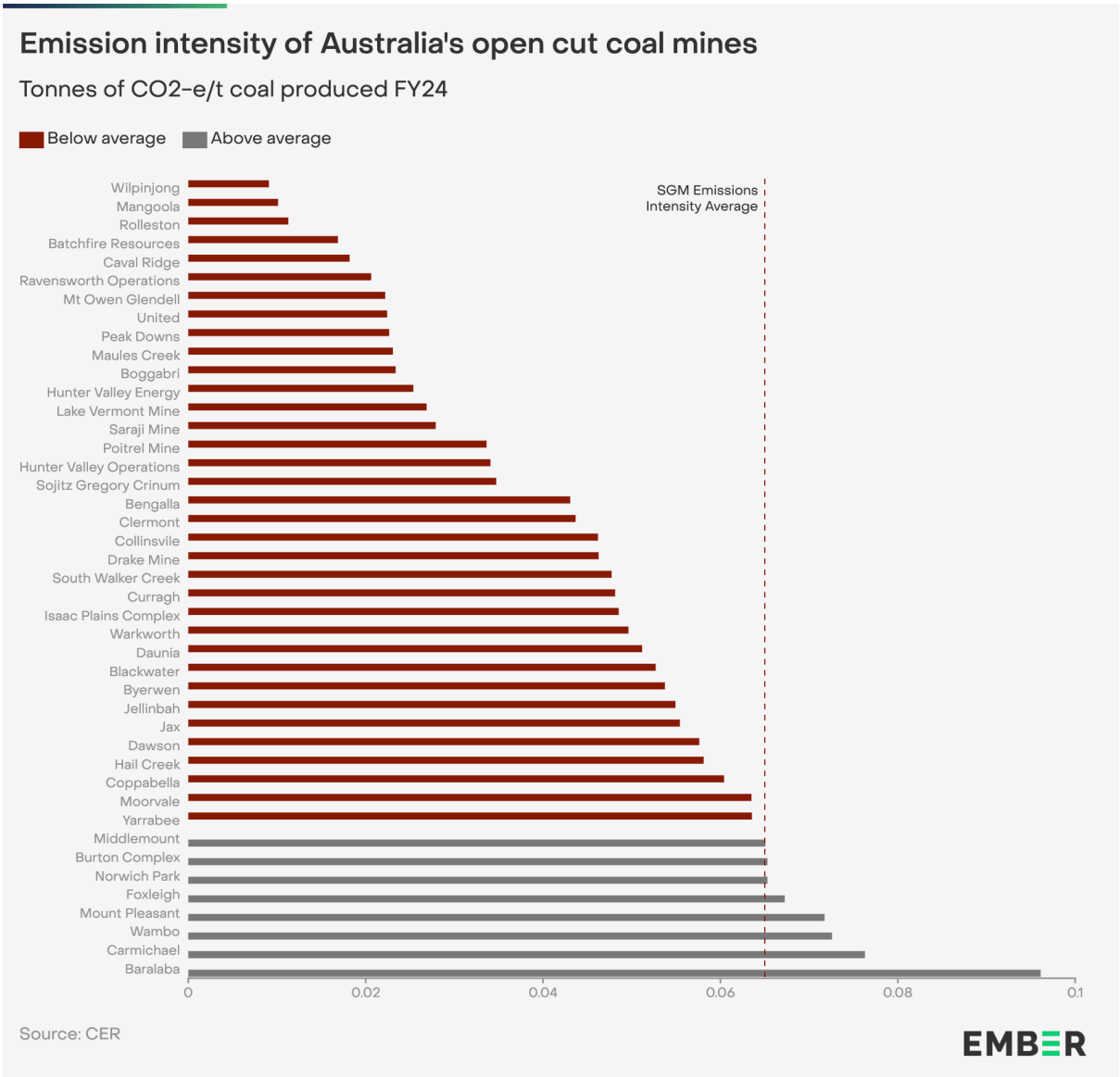
However, it is our belief that these changes still leave an important role for the CMWG to play, creating an ongoing incentive for decarbonisation of scope 2 emissions, as well as the potential for it to play a valuable role in mitigating emissions across open cut mines currently shifting towards a site-based emissions measurement approach. What's more, we believe that there is also additional potential for the CMWG method to play a future role in incentivising abandoned mine methane on closed or decommissioned mine sites.

Additionality across the Safeguard Mechanism

A key limitation of the Safeguard mechanism's ability to incentivise onsite mitigation across the coal sector is ironically due to its equal treatment of all coal mines. The Safeguard Mechanism is specifically designed to incentivise emissions reductions across the coal sector in a similar manner. However, due to its design of dynamically adjusted emissions baseline that progressively incorporates the sectoral average emissions intensity each year, it will have a much greater impact on facilities that fall above, rather than below the emissions intensity average. This will lead to significant reduction requirements on high emitting underground mines towards 2030, but may perversely reward lower emitting open cut mines per tonne of coal produced.

Our analysis of emissions intensity reporting for 2023-2024 indicates that in both Queensland and NSW, the vast majority of open cut coal mines have reported emissions intensities well below the sectoral average. This will effectively mean that their Safeguard Mechanism emissions baselines will progressively reward their production towards 2030, unless this is addressed in the planned Safeguard Mechanism review in 2026-2027.

However, under existing regulatory incentives, we do not believe that the Safeguard Mechanism will provide the adequate regulatory mechanism to reduce their fugitive methane emissions, and that there will be an important role for supplementary incentives for direct mitigation, even of scope 1 emissions, such as the CMWG.



Ongoing need to incentivise scope 2 emissions reduction

Another key limitation of the Safeguard Mechanism is the lack of incentives for scope 2 emissions, especially in regards to electricity and energy consumption. ARENA estimates that the broader Australian mining sector equates to roughly 10% of Australia's total energy

use, and consumption has risen significantly as mining volumes have also increased. In addition, greater update of more electrified processes within mining has led to greater reliance on grid electricity. With the possible integration of widespread battery electric or hybrid mining trucks over the next decade, overall electricity demand from the mining sector would likely increase.

This shift also highlights a potentially increasingly important role that the CMWG can play going forward. Coal mine waste gas (CMWG), primarily methane, offers a partial solution to the issue of increasing electricity demand, especially in the context of a broader electricity grid supported by variable renewable energy.

Over the next 10 years while the electricity grids of NSW and QLD will likely undergo considerable transition, CMWG-powered plants could supply much-needed electricity to ensure grid reliability, effectively "firming" renewable output. This could potentially lead to scope 2 emissions reductions, while additionally stabilising the grid during peak demand periods, reducing the risk of power outages and ensuring a continuous, reliable supply of energy, even in the context of growing electricity needs.

The extension and expanding the CMWG method could ensure both the utilisation of methane for energy generation, but in this way also enhance grid flexibility. By creating the right incentive structure for repurposing otherwise vented or flared gas, CMWG-powered facilities could indirectly support the energy transition in the short term, especially if it was able to be utilised for balancing the grid through energy storage, peaking power support and grid stability.

However, we do not see this as a long term solution, and believe there are important guardrails and timelines that need to be in place in order to support the full energy transformation across Australia.

NGERs shifts to Method 2 highlight a renewed opportunity for the CMWG method to play a role across open cut mines

The recently required shift to site-specific measurement of fugitive methane emissions according to Method 2 under the NGER scheme reforms announced in 2024 also highlight the potential for increased uptake of CMWG method across open cut mines.

The Climate Change Authority (CCA) 2023 review of the NGER legislation recommended the

complete phase out of state-based emissions factors across open cut coal mines (Recommendation 15). As indicated in their review, the Climate Change Authority estimates that this shift will largely impact open cut coal mines across Queensland, where the vast majority of open cut mines continue to estimate fugitive emissions using state-based averages. The CCA estimated that 72 per cent of fugitive emissions at open cut coal mines were currently reported using Method 1 in Queensland, while only making up 26 per cent of fugitive emissions reporeted in New South Wales.

The office of Impact Analysis estimates this shift, which is currently underway, may cost up to $100 million initially, as well as $3 million in ongoing annual measurement costs. This cost, as well as the potential range of fugitive emissions that will now come under site specific estimates in Queensland highlight a key regulatory shift that would likely increase the sectoral interest in the CMWG method across open cut mines, if the opportunity was made available.

This has lately been highlighted by the proposal from South Walker Creek to develop a CMWG-power station that they believe could result in potential annual reduction of 647,000 tonnes CO2-e across Scope 1 and 2. While Ember has not been able to verify this estimate, it is a clear indication of the potential industry demand that could come from open cut mines across Queensland, now that site-specific methane estimates will become widespread.

2. Whether method provisions for measuring and verifying abatement estimates are fit for purpose. Are there material reductions or increases in emissions that should be accounted for in the method?

The existing provisions for measuring and verifying methane emissions, capture and displacement are adequate, but require ongoing improvement as measurement and verification tools are currently undergoing a critical transformation in both accuracy and accessibility. This is especially important if the CMWG method will be expanded to incorporate surface or open cut mines.

The current recommendations for Method 2 that enable coal mines to develop a site-specific estimate of their methane emissions were developed by the Australian Coal Industry's Research Program (ACARP) and implemented in 2011.

Following a year-long review of the national emissions reporting system, the Climate Change Authority recommended a series of integrated changes required to improve transparency, measurement approaches, and top down emissions verification at coal mines across

Australia. These recommendations not only included the phase out of state-based emissions factors, but also a department led review of Method 2, which it noted was "disorderly", and needs to be reviewed "as a matter of urgency". The CCA report highlighted that the key challenge for the government is not only to improve bottom-up estimates, but to institutionalise a diverse range of measurement approaches, including top-down verification systems across Australia's coal mining industry.

To develop this system, the CCA recommended that a panel of experts should have already been commissioned ("in the first quarter of 2024") to develop the necessary guidelines, methods and standards for "making transparent, repeatable and credible top-down measurements" across the coal industry. This has important implications for the CMWG method going forward, including in regards to underground mines, but especially if it is to be incorporated into open cut mines going forward.

International best practice recommendations of measurement approaches for the coal sector recommend utilising a combination of technologies to generate a multi-input emissions model. This approach should take into account methane variability, spatial and climatic factors, and changes to the permeability of the coal seam, as well as major pollution events.

As such, Ember suggests the current practice of geotechnical cores to establish a methane gas model be combined with complementary total site-level measurements conducted to ensure site-level reconciliation with source-specific measurements. This could incorporate stationary, satellite or drone-based remote sensing as a key verification addition to ensure the integrity of any methane abatement under the CMWG method going forward, as well as support the ongoing reform initiatives that are currently ongoing. We believe these measurement and verification improvements would be well suited to both open cut and underground mines, which currently measure emissions using a well-supported direct measurement approach, but is largely applied on a periodic basis.

3. Whether changes to the method should be made with respect to eligible carbon abatement that can be counted in Australia's National Greenhouse Accounts:

Yes. Abatement from coal mine gas conversion and electricity displacement should be clearly included in the NGA, with annual reporting requirements updated to reflect any new technologies or methods that increase the abatement potential of these activities.

Any change to the eligibility of specific emissions reduction activities—such as the inclusion of open-cut mines—should be accounted for to avoid double-counting.

5. Whether the method sufficiently accounts for material greenhouse gas emissions directly resulting from carrying out the project:

Yes, the method appears to generally account for direct emissions resulting from projects (such as those from venting or flaring methane). However, it would benefit from more detailed tracking of secondary emissions impacts, such as those from electricity generation or any unintended leaks that may occur when transitioning to new methane capture methods. This reflects a broader need to ensure a dynamic approach to measurement and verification going forward, in a manner that appropriately incorporates any changes, downtime or shifts in flaring techniques that could result in unintended increases in emissions that should be properly tracked and accounted for.

6. Whether the inputs and variables used in the method's abatement equations for both the conversion of methane and displacement of electricity remain conservative:

As technologies advance, inputs and variable values should be regularly updated to reflect actual project data. Efficiency improvements in methane capture and electricity generation will result in larger than previously calculated emissions reductions, so periodic updates to the abatement equations are important.

7. Should the crediting period be longer than 12 years for CMWG activities?

A 12-year crediting period may be too short for some coal mine gas conversion projects to fully realise their potential return on investment. However, we also believe the CMWG method needs to strike an appropriate balance between ensuring and incentivising decarbonisation on coal mines, while not proactively incentivising the mine's potential lifespan. We therefore feel that the crediting period may be appropriate, but should not be applied on expanding or extending coal mines.

8. Would including open-cut mines as eligible sites result in overall abatement on a year-by-year basis?

Yes. See answer 1

9. What modelling and measurements would have to be done to calculate expected emissions in the normal course of events vs. abatement from a project on a year-by-year basis?

One key concern about the appropriate additionality of the CMWG method continuation would be to ensure against additional CSG exploration and capture that would not otherwise take place in the normal operation of the coal mine. This poses a particular challenge in the case of new mines or mines that have not yet utilised Method 2 to estimate their emissions in their existing operations, such as the case of South Walker Creek.

While Ember is encouraged by the opportunity that South Walker Creek presents as a potential mitigation site, it is also challenging to verify the estimated mitigation potential considering the lack of transparency and lack of public information regarding the estimated methane content of the mine.

Going forward Ember recommends that any facility applying to utilise the CMWG method should clearly and transparently present their emissions baselines and measurement estimates through a full greenhouse gas management plan, with clear modelling of their estimated methane emissions baseline and transparent reporting on how that model was generated.

We also recommend that all inputs to that model be clearly presented and peer reviewed by an independent expert. Finally we recommend that verification of methane abatement should be conducted in line with our answer to question 2.

10 & 11. What would be the expected uptake of projects and abatement if open-cut mines were eligible sites?

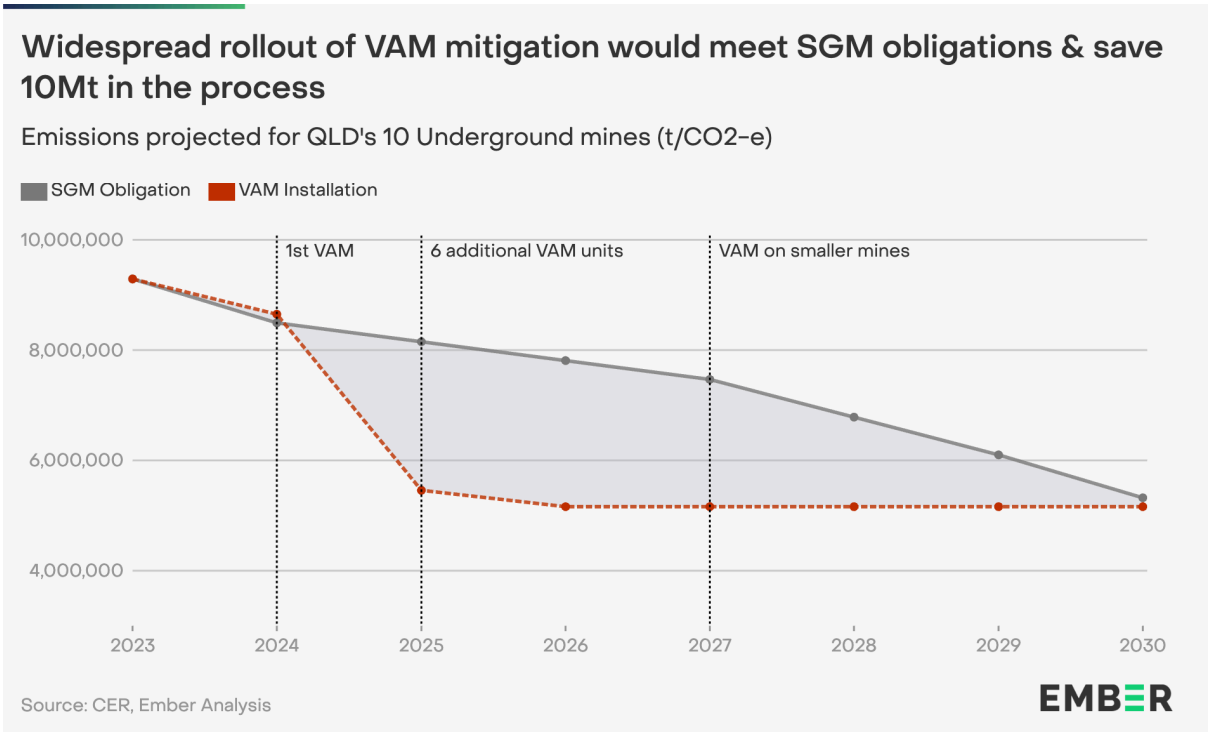
The uptake could increase significantly as outlined in question 1.

12. What could the uptake of ventilated air methane only projects look like over the next 10 years?

If ventilated air methane were creditable, the uptake would likely be limited due to the regulatory boundaries between the CMWG method and the Safeguard mechanism in addressing scope 1 emissions. We also believe that due to the nature of ventilated air methane, that the ability to utilise it to generate electricity may be limited across the coal sector.

However, we also recommend that due to the current limited interest in VAM uptake from the coal sector, that the CMWG method could reconsider its limited application against scope 1 emissions. The CMWG method may be able to provide additional incentives for onsite methane abatement on underground mines in the pre-2030 period. This could provide a limited yet valuable additional incentive in the interim period, which we believe would not be necessary post-2030 due to the likely increasing cost of ACCUs and SMCs. However, for the pre-2030 period, it may play a valuable additional role in incentivising onsite methane abatement, rather than offsetting under the Safeguard Mechanism.

Ember estimates that through the targeted combination of VAM mitigation projects applied on the top 12 highest emitting mines in Queensland, that an additional 10 million tonnes of CO2-e could be reduced, above and beyond existing Safeguard mitigation requirements. This we believe would be similarly impactful across NSW.



Ember also believes that the CMWG method could play a valuable role in incentivising emissions reductions from closed underground coal mines, where the existing voluntary measurement approach to measurement may not be effective in capturing the full extent of emissions from abandoned mines.

13. What portion of a mine's fugitive emissions typically come from ventilated air methane, and would this portion increase or decrease in the next 10 years?

Ventilated air methane typically represents over 80 per cent of underground mine scope 1 emissions, though this can vary between mines. However, current uptake of VAM mitigation is limited, and the current estimated onsite emission reductions under the Safeguard Mechanism show extremely limited onsite abatement is currently being uptaken by the coal sector.

14. Suggestions to improve the CMWG method:

1. Build in flexibility for the CMGW method to potentially incentivise and incorporate multi-site abatement or displacement projects.

2. Update abatement equations based on improved technology and real-world data.
3. Include a diverse measurement and verification framework for measuring emissions from open-cut mines if they become eligible.
4. Expand capacity for long-term monitoring of projects to ensure they continue to deliver expected abatement.
5. Explore opportunities to supplement ongoing financing tools
6. Explore opportunities to further incentivise onsite mitigation not currently being uptaken by the Safeguard Mechanism
7. Expand the method to incorporate open cut mines, but ensure that emissions abatement and utilisation is additional and is not acting as an incentive for expanded CSG exploration
8. Continue to refine the methodology through broad stakeholder engagement