INDEPENDENT EXPERT ADVISORY PANEL FOR MINING

ADVICE FOR:

NSW ENVIRONMENTAL PROTECTION AUTHORITY

RE:

- **Climate Change Assessment Requirements for Large Emitters (draft)**
- **GHG Assessment Guide for Large Emitters (draft)**

October 2023

Advice No: IEAPM 202310-2

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1.0 SCOPE OF IEAPM ADVICE

On 20 September 2023, the NSW Environmental Protection Authority (EPA) requested the Independent Expert Advisory Panel on Mining (IEAPM – the 'Panel') to provide the following advice on its draft Climate Change Assessment Requirements (CCARs) for Large Emitters and its draft GHG Assessment Guide for Large Emitters:

> *Review the draft CCARs (Tab 2) and GHG Assessment Guide for Large Emitters (Tab 3) and provide advice on:*
>
> - *whether the CCARs and Guide are fit-for-purpose for the coal sector (or large emitters more generally) (note the draft CCARs and Guide will apply to all large emitters, not just coal mines)*
> - *whether the CCARs and Guide are reasonable for a proponent to deliver against*
> - *whether the CCARs and Guide are reasonable for the EPA/Department of Planning and Environment (DPE) to assess against*
> - *any obvious gaps in the Guide*
> - *any areas of the Guide that could reasonably be strengthened, clarified, or otherwise improved*
> - *whether the terminology is intuitive and appropriate for the audience*
> - *other relevant guidance material that could be referenced in the Guide*
> - *any other issues or suggestions.*

The advice was requested by 18 October 2023 (4 weeks) but ideally within 2 weeks.

Unfortunately, the IEAPM has not been in a position to fulfill all of these requests. It was only recently requested to include GHG in its portfolio and is still building capability in this area. The three IEAPM members who could contribute to providing advice to the EPA were already committed to providing advices to the Department of Planning and the Environment (DPE) on GHG Minimisation Plans associated with two coal mining projects.

However, the IEAPM is able to provide comment on aspects of the two documents. Comment has been confined to coal mining and the skill set of the following Panel members, whose summary CVs are presented in Attachment 1.

- Em. Professor Jim Galvin – Chair
- Professor Dianne Wiley
- Dr Ray Williams

2.0 FOUNDATION CONSIDERATIONS

2.1. COAL SEAM GHG SOURCES AND CONTENT

When developing and applying the Greenhouse Gas Assessment Guide (GHGAG), one needs to appreciate the difficulties and error ranges associated with predicting/determining coal seam GHG emissions from underground coal mining operations. Historically, the mining industry has been focussed on the control of coal seam gas emissions from mine workings but not the mitigation of these emissions (recognising, however, that some control measures can also mitigate emissions). There has been limited concern for the total volume of gas emissions from a mine so long as they did not hinder production.

Because coal seam gas emissions are a critical health and safety risk in underground coal mining, considerable effort goes into determining gas types and concentrations ahead of mining and capturing gas emissions and exhausting them to the surface through well-defined conduits (drifts, shafts and boreholes). This situation includes GHG emissions from overlying and underlying strata impacted by mining in the target seam.

Gas emission from underground coal mining is a complex process and predicting it involves assessment of the gas reservoir properties of all the affected stratum and the response to depressurisation as a consequence of mining. Gas management (gas drainage and mine ventilation) relies upon forward assessments involving complex modelling, but these are typically imprecise, depending upon the quality and extent of empirical data that can be used to refine the models.

An area that is not addressed at all is gas emissions from coal after it exits the mine. Depending on whether a coal seam has been pre-drained prior to mining, it is possible that up to half the virgin gas content will still be in the coal as it exits the mine portal. Current industry practice is to use a fixed emissions factor for calculating GHG emissions from this coal (this factor being 0.019t CO_2 e per tonne ROM[1] coal, which meets the requirements of the Clean Coal Regulator). Hence, the actual GHG emissions could be higher or lower than predicted.

The determination of GHG emissions from coal seams in surface mining is more problematic, primarily because all gas sources (primarily coal seams) above the target mining seam are disturbed to the extent that they will be almost fully depleted of their GHG content during mining, transporting, stockpiling or disposal in overburden dumps and these emissions are vented directly to atmosphere. Additionally, gas sources in the floor of the mined seam can contribute to GHG emissions. This means that the volume of these emissions is not directly measurable. Coal seam GHG emissions can only be estimated, primarily from gas-in-place determinations. Together with the imprecise nature of quantity and quality determinations of available gas related data, this results in considerable uncertainty being associated with these estimates. As is the case when dealing with uncertainty in other situations, there is potential to use probability modelling to better quantify the uncertainty associated with these GHG estimates. However, this approach is still to be adopted for assessing and reporting GHG emissions from coal mining in Australia.

These types of considerations give rise to questions as to how the Safeguard mechanism baseline will be established in coal mining and what will affect it going forward. An emissions baseline is going to be difficult to set because almost every mine is working in an environment of changing gas reservoir conditions and, for underground mines, changing approaches to gas management which affect the overall GHG emission outcome.

The Safeguard mechanism baseline is likely to have to be adjusted either up or down periodically on the basis of forward GHGE assessments. That makes the technical foundation for forward assessments fundamentally important. Some existing mines are likely to be found wanting because of a lack of

[1] Run of mine

historic gas monitoring data and gas reservoir definition. Potentially, the establishment of the baseline being made on the basis of forward estimates could give rise to a tendency to inflate the baseline so that emission reduction targets can be more easily realised. On the other hand, experience suggests that it is common for forward assessments to underestimate emissions.

2.2. MITIGATION OF COAL SEAM GHG EMISSIONS

Although underground coal mines offer the potential to capture GHG emissions from coal seams, the options to then mitigate these emissions are limited or non-existent in many cases. This is because the captured mine atmosphere does not comprise gas mixtures of an appropriate type and concentration for the untreated mine atmosphere to power diesel engine driven generators or to be flared (to convert methane into carbon dioxide, which is a 28-times less potent GHG than methane). Ventilation Air Methane (VAM) oxidation technology to mitigate the emissions of high quantities of methane at low concentrations contained in exhausted mine air is yet to be proven a technical and commercial option. In addition to the technological challenges associated with an oxidation process, there are still challenges to be overcome in preventing a flareback from the oxidisation chamber running back into the mine workings and initiating an underground explosion. Currently, the only options to mitigate GHG emissions for many underground mines revolve around reducing leakage of impounded GHG from abandoned sealed sections of the mine.

In the case of open cut mining, the capture of coal seam GHG emission is basically limited to predrainage of select coal seams. Whether such gas is predrainable requires site specific studies and trials. The preceding considerations in relation to the limited potential to then mitigate these captured emissions also apply.

3.0 IEAPM COMMENTS

3.1. EPA CLIMATE CHANGE ASSESSMENT REQUIREMENTS

The draft Climate Change Assessment Requirements for Large Emitters (CCARs) proposes that a proponent must carry out a Greenhouse Gas Assessment (GHGA) and prepare a Greenhouse Gas Mitigation Plan (GHGMP). The Panel notes that the requirement for a GHGMP has been included in consent conditions for some coal mines since at least 2010. While the consent conditions do not specify that a GHGA has to be carried out, it goes without saying that such an assessment is required in order to know what one is trying to manage so that a sensible and effective GHG management plan can be developed.

The Panel supports the stipulation of a standalone Greenhouse Gas Assessment since the determination of an emissions baseline in coal mining is difficult and is compounded by the dynamic and variable nature of the mining environment and mining operations which, in turn, give rise to variable and sometimes unpredictable GHG emission sources, contents, and concentrations. Based on the Panel's limited experience in reviewing GHGMPs to date, it is the Panel's opinion that a standalone GHGA is warranted to bring greater rigour to identifying GHG emission sources and to more accurately quantifying their contribution to total GHG emissions.

3.2. GREENHOUSE GAS ASSESSMENT GUIDE FOR LARGE EMITTERS

3.2.1. The Need for a GHGAG

The Panel identifies with the need for the production of the Greenhouse Gas Assessment Guide for Large Emitters (GHGAG). The Panel's recent and ongoing reviews of two GHGMPs have highlighted the need for this type of guidance material. The detail in the proposed new guidance material contrasts with the guidance in current consent conditions for some emitters, which tends to be generalised and to lack quantitative requirements and performance measures. Reference, for example, the following 2010 consent conditions currently applicable to one large underground coal mine in NSW.

> ***Gas Drainage***
>
> *The Proponent shall implement all reasonable and feasible measures to minimise the greenhouse gas emissions from the underground mining operations to the satisfaction of the Secretary.*
>
> *Prior to carrying out longwall coal mining operations, the Proponent shall submit a Greenhouse Gas Minimisation Plan for the approval of the Secretary. This plan must:*
>
> *(a) be prepared in consultation with OEH;*
> *(b) identify options for minimising greenhouse gas emissions from underground mining operations, with a particular focus on capturing and/or using these emissions;*
> *(c) investigate the feasibility of implementing each option;*
> *(d) propose the measures that would be implemented in the short to medium term on site; and*
>
> *(e) include a research program to inform the continuous improvement of the greenhouse gas minimisation measures on site.*

Unlike other possible mining-induced consequences, such as ground cracks, water ponding, decrease in groundwater level and disrupted stream flow, consequences associated with GHG emissions are not immediately apparent (for example, visible, audible and/or detectable) on a site-specific basis and, therefore, have historically not been the subject of rigorous prediction, monitoring, and timely responses to deviation from predictions. This is apparent when comparing the content, construct and regulation of

management plans for the minimisation of GHG emissions with those of management plans for visible and/or measurable mining-induced impacts, such as structural damage to surface features and depressurisation of groundwater reservoirs.

3.2.2. Development and Refinement of the GHGAG

The EPA has made the Panel aware that its *Climate Change Action Plan: 2023-26* includes 25 actions that it proposes to take over the next three years as part of its evolving regulatory response for climate change. As it has advised the Panel, many of these actions are focussed on helping licensed industry to decarbonise and build greater preparedness and resilience to climate change risks.

The Panel advises that the challenge facing many coal mines, at least in the short to medium term, is the limited scope to reduce the largest component of their total GHG emissions, being those derived from coal seams and to a lesser extent, other porous strata. Hence, the proposed first stage of the EPA's Climate Change Action Plan, which is concerned with *'listening and gather information'*, will be particularly important for informing the development of a workable and effective climate change action plan in relation to coal mining, especially within a three-year time frame.

Appendix D: GHG Mitigation Plan outline proposes that GHG emission reduction targets for Scope 1 GHG emissions provides for *'interim targets to be specified at 5-year or shorter-term intervals'.* In light of commentary provided in Section 2.0 of this Advice Report, the Panel is of the view that these targets and the policies that support them should be reviewed at least every three years until such time as GHG emission assessment methodologies and coal seam GHG emission mitigation options and effectiveness are clearly understood and articulated.

3.2.3. Box 4. Underground Coal Mine Modification Case Study

The Panel is of the view that either:

1. this case study needs to be supported by one that applies to another large GHG emissions sector, in order to avoid the GHGAG appearing to have an unbalanced focus on one large emissions sector; or
2. that it is withdrawn.

If the Coal Mine Modification Case Study remains, it needs significant modification for reasons that include:

1. While it is stated to apply to an underground coal mine, the graphics (cartoons) of equipment and their power source relate to surface mining. Underground coal mining does not utilise trucks and diggers and the majority of equipment that is utilised is already electrically powered.
2. VAM is yet to be proven a technically and commercially viable technology.
3. Other viable mitigation measures are not acknowledged.
4. It is difficult to understand how '*Project only emissions'* have been differentiated from other emission scenarios.

3.2.4. Other Comments

1. The Panel is of the view that the GHGAG is appropriately generic in its nature and reference to supporting documentation, and that the terminology is intuitive and appropriate for the NSW coal sector.
2. If there is a need for any coal mine specific guidance, this should become apparent in the process of executing the *Climate Change Action Plan 2023-26*.
3. The Panel strongly supports the requirement for independent expert review. It suggests that probity guidelines should be developed for the appointment of expert reviewers and that such appointments be required to be approved by the Secretary.

4. The draft GHGAG requires the independent peer review cover *'any proposed offsets as to whether they meet requirements and are likely to be available as the time of proposed surrender'*. The term *'surrender'* needs to be defined. One possible interpretation is that no offsets are to be executed prior to closure of an emitting operation. In the case of a mining operation, the Panel suggests that offsets should be enforced progressively and within a set timeframe after being triggered.

ATTACHMENT 1

Summary CVs

Emeritus Professor Galvin has professional qualifications in science, mining engineering and mine management and practical experience in all facets of underground coal production and mine management. He has led major industry and university geotechnical research groups in South Africa and Australia and was Professor of Mining Engineering at the University of New South Wales from 1991 to 2006 and Head of School from 1995 to 2003, during which time he co-authored and contributed to the delivery of the NSW Statutory Mine Ventilation Officers Course. He was a member of the Coal Innovation NSW Ministerial Council from 2011 to 2019, and Chair from 2017 to 2019, charged with providing the Minister with advice on matters relating to low emissions coal technologies and making recommendations regarding appropriate funding and research opportunities.

Professor Dianne Wiley is a chemical engineer and Dean of Engineering at the University of Newcastle and a recognised world leader in the development of membrane systems for water and wastewater treatment and other applications, and in the assessment of a broad range of technologies for carbon capture and storage across the whole process chain. Her previous roles include Associate Dean and Acting Dean of Engineering at the University of New South Wales and Head of School of Chemical and Biomolecular Engineering at the University of Sydney. Associated appointments include Capture Program Manager and Economics Leader at the CO2CRC and a member of the Coal Innovation NSW Ministerial Council.

Dr Ray Williams is a geologist who commenced his career in roles as a coal geologist and geotechnical engineering, before being involved exclusively in coal seam gas related work for over four decades. He founded GeoGAS in 1990, a gas consultancy and laboratory services company serving the underground coal mining and coal seam gas industry (which was acquired by Runge Ltd. (RPM Global) in late 2007). Dr Williams' areas of expertise and experience include gas reservoir definition; gas production assessment and modelling for coal seam methane production; laboratory gas testing; and gas emission assessment for coal mine gas management. He has overseen the development of a number of techniques for measuring gas content and release rates and a number of gas emission models and participated in delivering industry training courses related to the NSW Statutory Ventilation Officers course and professional development courses on coal seam gas and mine gas management.