EURACOAL
European Association
for Coal and Lignite
AISBL

EURACOAL Position Paper

on an EU strategy to reduce methane emissions (COM(2020) 663)

The EU Methane Strategy, published by the European Commission in October 2020, covers several areas of human activity. For the energy sector, the focus is on fugitive emissions from oil and gas production, supply infrastructure and end use, rather than from coal mining. In light of the international nature of emissions from EU energy-supply chains, this is the right approach and the strategy should be used as a tool in climate diplomacy. In the case of methane from coal mines, EURACOAL highlights in this paper several actions at the EU level that would further encourage the use of this methane, turning an environmental issue into a clean energy resource.

Summary

Methane emissions from coal have been measured in detail over recent decades. Measurements of thermal methane emissions from lignite, which is produced widely across Europe at open-pit mines, are reported to be low and marginal, at the limits of detection.[1] It is therefore not a priority to address these emissions. Hard coal is now mined in only a small number of member states and emissions of methane from active coal mines are currently a tiny fraction of past emissions given the industry's contraction, especially since 1990. Nevertheless, it is important to keep in mind that the ventilation of active underground coal mines is necessary to keep mineworkers safe, and thus requires the appropriate dilution of methane with fresh air down to a maximum threshold far below the lower explosive range of 5 vol% of methane (CH_4).

Given the declining trend of EU coal mining, more focus should be placed on abandoned mine methane (AMM). This requires smart closure plans for coal mines, with repurposing of assets to limit emissions and maximise the use of the available methane resource. The coal sector is rich in knowledge and there are already several pilot projects and initiatives in Europe, including the world's first International Centre of Excellence on Coal Mine Methane established in 2017 by the Central Mining Institute (GIG – Główny Instytut Górnictwa) at Katowice, Poland under the auspices of the United Nations Economic Commission for Europe (UNECE).

Methane from coal mines is widely used for heating and power generation, including at over one hundred installations in the EU. The potential exists to use more mine gas, if new incentives were made available. Without action, existing facilities will close. In Germany, if support under the Renewable Energy Sources Act (EEG) ends, then large volumes of methane will be emitted to atmosphere, at least until water levels rise in the country's former coal mines. In the meantime, a solution is needed.

EURACOAL welcomes the Commission's statement to support more methane emission reduction projects. In this paper, we recommend amendments to legal texts and guidelines that would further encourage methane projects and bring substantial environmental benefits.

[1] The coalification process leads to the generation of thermal methane only within very mature brown coal, hard coal and anthracite, but not within lignite.

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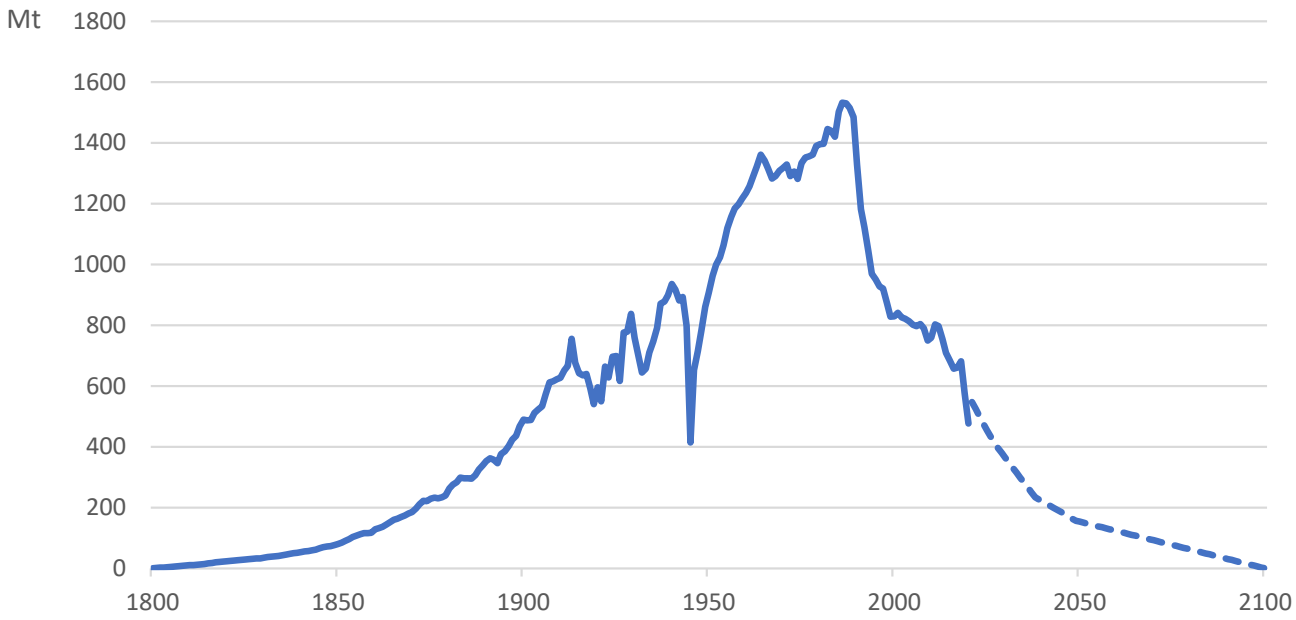
Background

Methane (CH_4) is a potent greenhouse gas (GHG) with a global warming potential (GWP) of 25 or 28 times that of carbon dioxide (CO_2), and with a global temperature potential (GTP) of 4.[2,3] Although water vapour and CO_2 are by far the most important GHGs, and methane is removed relatively quickly from the atmosphere by oxidisation, curbing the emissions of methane will be necessary to reach the EU's ambition of net-zero GHG emissions by mid-century.

Figure 1 – Historic (solid line) and forecast (dashed line) coal production at coal mines in Europe, including EU Member States, Turkey, Ukraine, the UK and Western Balkans[4]



Since the beginning of the Industrial Revolution, an estimated 125 billion tonnes (Gt) of coal have been mined in Europe (Figure 1). From this figure, we estimate that approximately 825 million tonnes (Mt) of methane have been emitted from European coal mines since the beginning of industrialisation through to 2020.[5] Given that the mean lifetime of methane in the atmosphere is 12.4 years and the UNFCCC assumes a 100-year time horizon for methane regulation, we can observe that atmospheric methane due to European coal mining is in steep decline for two reasons:

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[2] IPCC (2007), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

[3] IPCC (2013), *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,* [Stocker, T.F., D. Qin, G. K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

[4] Rutledge, D. (2011), "Estimating long-term world coal production with logit and probit transforms", *International Journal of Coal Geology*, 85 (2011) 23–33; BP (2020), *Statistical Review of World Energy 2020*, 69th ed., BP plc, London; and own forecasts.

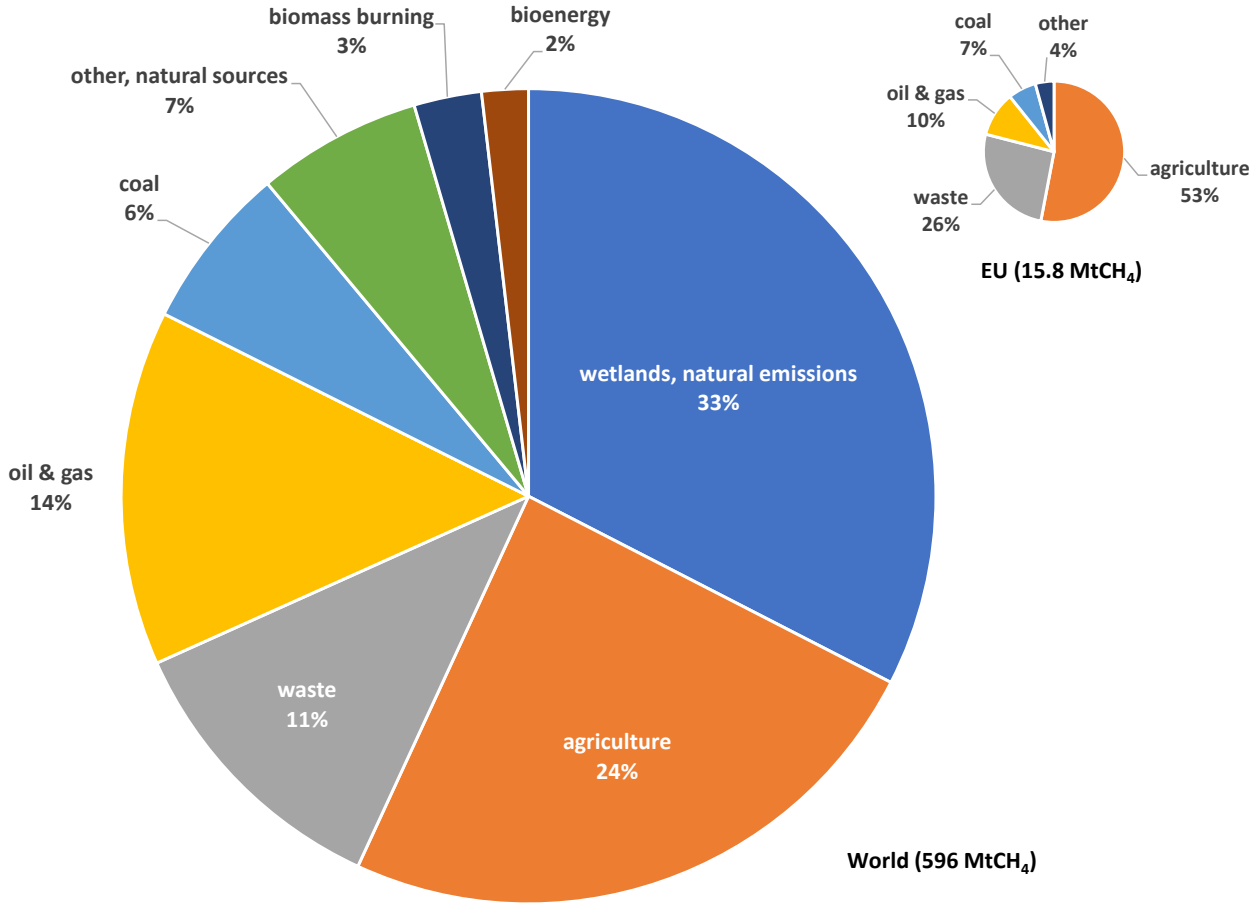
[5] Own calculations assuming an average methane content of coal of 10 m^3/t and coal production data from Rutledge, D. (2011), "Estimating long-term world coal production with logit and probit transforms", *International Journal of Coal Geology*, 85 (2011) 23–33 and Rutledge, D.B. (2019), *Energy: Supply and Demand*, 1st ed. Cambridge University Press, Cambridge, United Kingdom.

- Future coal production will be a tiny fraction of past coal production. In fact, based on current trajectories, Europe has already mined over 90% of all the coal that it will ever mine.
- Historic methane emissions from European coal mines are oxidising in the atmosphere at a faster rate than operating mines are emitting methane.

That said, we note that coal mining in China is at a very different point in its historical development – perhaps around its peak annual production of 3 800 million tonnes in 2019. Therefore, China may yet mine a further 200 billion tonnes of coal, this being far above the European total of 138 billion tonnes for all time. The control of methane emissions in regions where large-scale coal production is expected to continue for decades to come is a far more urgent and material issue than any controls at European mines.

Abandoned coal mines continue to emit methane for a period of time after mine closure until water levels rise and stop further emissions. For example, the end of coal production in Germany in 2018 has already led to a significant reduction of mine methane emissions, but emissions will continue in the short to medium term. In the longer term, as water levels rise in the former mines, a point is reached where methane emissions are reduced to a minimum, without need for regulation.

Figure 2 – Total global methane emissions, 2012/2019 and EU anthropogenic methane emissions, 2018[6]



[6] IEA Methane Tracker 2020 (non-energy data for 2012 – the latest year for which reliable estimates are available, Sauonis *et al* (2020); estimated energy data for the year 2019); COM(2020) 663 (breakdown of EU anthropogenic methane emissions); and European Environment Agency (EEA) greenhouse gas data viewer (total EU anthropogenic methane emissions for 2018).

According to current estimates, coal mines, both active and closed, could be responsible for around 10% of global methane emissions from human activities.[7] Expressed as a share of total methane emissions, including natural emissions, coal accounts for less than 7%. At the EU level (Figure 2), coal mining accounts for 6.5% of anthropogenic emissions. As a fraction of global emissions – natural and manmade – the EU coal sector accounts for 0.2% of the total. Despite these small shares, the European coal industry has been active in methane mitigation. Mine gas is used to generate electricity and/or heat at operating coal mines in Poland and the Czech Republic. Such combined heat and power or cogeneration projects are deployed elsewhere to minimise emissions of methane from abandoned mines, in France for example. With targeted incentives, more could be done.

Health and safety

Methane gas in mines presents a grave risk to the safety of mineworkers. At concentrations of 5-15 vol% of methane, the gas-air mix is explosive: some of the worst mining disasters in the world have resulted from methane explosions. Hence, for decades, EURACOAL members have worked to eliminate the safety risks of methane releases in coal mining, as required by law, as well as to closely monitor emissions, design effective capture and use systems and estimate fugitive emissions.

Methane is nontoxic. At the low levels found in safely operating coal mines, it has no health impacts.

Table 1 – Coal methane – definitions	
CBM	Coalbed methane is recovered from virgin (unmined) coalbeds by drilling wells from the surface, sometimes prior to underground mining
CMM	Coal mine methane is methane gas which is captured by drilling drainage boreholes underground before or during mining operations. Typically, 30% of coal mine methane can be drained and is often used for heat and power generation.[8]
VAM	Ventilation air methane is the methane desorbed from coal seams or released from voids during mining, not captured by drainage but diluted with fresh air for safety reasons before venting the mixed gas to atmosphere via mine roadways and exhaust shafts. Typically, 70% of mine methane leaves an underground mine in the ventilation air.[8]
AMM	Abandoned mine methane is the methane gas remaining (and in some instances newly generated by microbes) in closed coal mines. Methane held in voids, coal seams and other gas-bearing strata that have been disturbed or intercepted by mining operations can escape to atmosphere, but quantities vary from mine to mine. AMM emissions change with atmospheric pressure and will eventually stop when mines flood.
SMM	Surface mine methane is the methane released during opencast or open-pit mining. Emissions from surface lignite mines in Europe are reported to be low and marginal, at the limits of detection, because little or no thermal methane is present from the coalification process in these shallow, geologically young seams.

[7] IEA Methane Tracker 2020 (www.iea.org/reports/methane-tracker-2020)

[8] Creedy, David P., A. Saghafi and R. Lama (1997), *Gas Control in Underground Coal Mining*, IEACR/91, prepared by Wardell Armstrong in collaboration with CSIRO, Australia on behalf of IEA Coal Research – The Clean Coal Centre, London, April 1997.

Coal mine methane use

Several companies operate plants that use the coal mine methane (CMM) drained from mines for electricity and heat production in combined heat and power (CHP) plants (a.k.a. cogeneration plants in the US); more such projects are planned. As these projects are not economic compared with conventional projects using pipeline natural gas, several countries have introduced targeted support measures (*e.g.* Czechia, France, Germany, the UK and the US). In the EU, the European Commission has approved such support which has been highly successful, leading to a significant reduction in methane emissions.[9] In Germany alone, it is estimated that in 2021 around 4 $MtCO_2e$ of GHG emissions will be avoided, while producing around 650 GWh of useful electricity. There remains the potential to use CMM on an even larger scale by tapping the resources available across Europe. For example, a single new 60 MWe project at a large coking coal mine in Poland could reduce annual GHG emissions by 2 $MtCO_2$. However, there are barriers which need to be overcome.

In Germany, the financial subsidies for CMM plants, available for twenty years under the Renewable Energy Sources Act (EEG – *Erneuerbare-Energien-Gesetz*), are coming to an end with little progress on their renewal. As most plants were built between 2001 and 2004, this will almost certainly lead to the closure of most German CMM plants by 2025, many by the end of 2021. Methane emissions from the now closed coal mines will however continue and, if left unresolved, the result could be an environmental and public policy-making catastrophe. It is thus crucial to develop supportive measures for immediate action on CMM mitigation and use at the EU level.

There are two actions that can be taken relatively easily:

- **the exclusion of installations using methane from coal deposits (CMM, VAM, AMM and CBM) from the EU ETS; and**
- **the inclusion of projects using methane from coal deposits (CMM, VAM, AMM and CBM) under State-aid guidelines.**

Firstly, CMM projects at operating mines would become commercially viable if relieved of the need to purchase emission allowance certificates under the EU Emissions Trading System (ETS) Directive (2003/87/EC) for the CO_2 emitted from these facilities after combustion of coal mine methane. Other projects using VAM, AMM and CBM would also be encouraged and thus contribute to the mitigation of fugitive methane emissions. Certain other facilities are already excluded, namely biomass plants and waste incineration plants, so there is a precedent for making such exclusions where there are clear environmental benefits. Moreover, this directive is scheduled for revision, so there is a near opportunity to make this simple amendment.

Secondly, in order to give legal clarity and send a strong signal that the European Commission supports and promotes methane mitigation and use, EURACOAL recommends the inclusion of mine gas use in Annex 3 of the *Guidelines on State aid for environmental protection and energy 2014-2020* (2014/C 200/01) which are scheduled for revision having already been extended to the end of 2021. This would send a clear signal to member states that existing and future projects that mitigate methane emissions at operating and closed mines can be and need to be supported through national schemes.

Looking ahead, specific, long-term support for AMM projects can be justified given the GHG reductions they deliver by destroying fugitive methane. The European Commission should consider how the EU land use, land-use change and forestry (LULUCF) regulation could incentivise member states to enhance such methane removals by allowing a trade in net accounted removals of mine methane with other member states.

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[9] State aid SA.33995 (2013/C) (ex 2013/NN) – Germany – Support for renewable electricity and reduced EEG-surcharge for energy-intensive users, C(2013) 4424, European Commission, Brussels, 18 December 2013 (p.43).

Figure 3 – Suggested amendment to the EU Emissions Trading System Directive 2003/87/EC

19.3.2018 EN Official Journal of the European Union L 76/3

DIRECTIVE (EU) 2018/410 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 14 March 2018

amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814

(Text with EEA relevance)

ANNEX I

CATEGORIES OF ACTIVITIES TO WHICH THIS DIRECTIVE APPLIES

1. Installations or parts of installations used for research, development and testing of new products and processes and installations exclusively using biomass or coal mine methane collected at operating or abandoned coal mines and used in installations for heating/cooling and/or the production of electricity are not covered by this Directive.

2. The thresholds values given below generally refer to production capacities or outputs. Where several activities falling under the same category are carried out in the same installation, the capacities of such activities are added together.

3. When the total rated thermal input of an installation is calculated in order to decide upon its inclusion in the EU ETS, the rated thermal inputs of all technical units which are part of it, in which fuels are combusted within the installation, are added together. These units could include all types of boilers, burners, turbines, heaters, furnaces, incinerators, calciners, kilns, ovens, dryers, engines, fuel cells, chemical looping combustion units, flares, and thermal or catalytic post-combustion units. Units with a rated thermal input under 3 MW and units which use exclusively biomass or coal mine methane collected at operating or abandoned coal mines and used in installations for heating/cooling and/or the production of electricity shall not be taken into account for the purposes of this calculation. 'Units using exclusively biomass' includes units which use fossil fuels only during start-up or shut-down of the unit.

Activities	Greenhouse gases
Energy activities	
Combustion installations with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations or installations using coal mine methane collected at operating or abandoned coal mines for heating/cooling and/or the production of electricity)	Carbon dioxide Other specialised pollution-control activities

Legal opinion

According to legal analysis (attached) commissioned by the German mine gas association (IVG – Interessenverband Grubengas e.V.), support for coal mine methane use is already within the scope of the EU guidelines on State aid published in June 2014. The European Commission has also determined that financial measures open to producers of electricity from mine gas are generally compatible with the rules on State aid covering the single market, following from Article 107(3)(c) of the TFEU.[10] An explicit mention in Annex 3 of the guidelines would however positively influence the national political debate on support schemes for methane use.

Given the urgency of the situation in Germany and other EU countries, the inclusion of coal methane in the guidelines would be a pragmatic and effective step with immediate effect as new guidelines are planned to come into force in 2022. Such a move would reflect the current EU aims and ambitions under the European Green Deal, such as the reduction of greenhouse gas emissions towards net zero and the "energy-efficiency-first" principle, as well as serving as a showcase to third countries who must also address methane emissions.

[10] State aids SA.24642(N 708/2007) – DE – State aid for the closure of hard coal mines and SA.33766 – notification of aid to coal for 2011, C(2011) 8882, European Commission, Brussels, 7 December 2011 (p.12).

Figure 4 – Three possible options to amend the Guidelines on State aid for environmental protection and energy 2014-2020 (European Commission Communication 2014/C 200/01)

28.6.2014 EN Official Journal of the European Union C 200/1

COMMUNICATION FROM THE COMMISSION

Guidelines on State aid for environmental protection and energy 2014-2020

(2014/C 200/01)

ANNEX 3

List ([1]) of eligible sectors ([2]) under Section 3.7.2

NACE code	Description
510	Mining of hard coal
620	In so far as it applies to "the extraction of coal mine methane"
3821	Disposal of non-hazardous waste by combustion or incineration or other methods, with or without the resulting production of electricity or steam, compost, substitute fuels, biogas, ashes or other by-products for further use etc.
3900	Other specialised pollution-control activities

Ventilation air methane

The control of methane in coal mine ventilation air presents a real challenge. Technology is available to capture and use this ventilation air methane (VAM) which has, by law, a low methane concentration of say less than 1 vol%. If concentrations are above 0.3 vol%, regenerative thermal oxidiser (RTO) technology can be used. If CMM is available to enrich VAM, then in theory all methane emissions can be captured and abated, but this is a compromise as CMM can be used more efficiently directly in gas engines: the WestVAMP project in Australia is an excellent example. Nevertheless, even with a concentration of 0.6 vol%, it is possible to generate heat from the RTO for district heating.

VAM projects could be financially viable if supported with incentives, *i.e.* a framework that values the emission reduction at a carbon price equivalent to 10-12 USD/t might be sufficient, according to the suppliers of oxidisers. However, a holistic approach to identify and address all barriers is needed.

VAM projects could serve as a showcase for EU action to address methane emissions that could be followed in third countries with similar needs to control methane emissions from coal mines. In fact, some projects are already in operation in China. The European Commission should pay attention to the rules and evaluation of EU-supported RTD projects that demonstrate innovative, new technologies for the mitigation of mine methane emissions with global application – specifically those using EU funds such as pillar 2 of the Just Transition Mechanism, EFSI or LIFE, as well as the modernised Research Fund for Coal and Steel.

Monitoring, reporting and verification

On monitoring, reporting and verification (MRV), the legally required measurement and reporting of methane for safety reasons is already of a very high standard in the coal sector. However, there are no EU-wide standards and this omission should be addressed, especially in the case of abandoned mines, with guiding principles rather than prescriptive regulation.

As described above, methane from active and closed coal mines is currently used for energy production via boilers and gas engines. Such projects are critical for a successful energy transition – helping to balance power supply and demand. However, the availability of mine methane gradually decreases after mine closure, so a "window of opportunity" exists when energy production projects can be considered. In this respect, the monitoring of methane at both active and closed coal mines is essential to estimating the energy production potentials of different sites.

Currently, the sector reports "Tier 2" emissions according to the UNFCCC reporting framework, these being maximum values based on detailed measurements of the methane content of coal and lignite, as well as other factors such as local geological conditions. With time and with progress on measuring methods, the sector will be able to move towards a "Tier 3" reporting framework, but only in cases where this adds real value over and above "Tier 2" reporting, such as when considering projects to use mine methane for energy production.

The European Commission could lead the development of a common methodology for coal methane measurement, based on the work of the UNECE Group of Experts on CMM and the Global Methane Initiative, as well as best practices under the US Greenhouse Gas Reporting Program (GHGRP).

EURACOAL suggests setting up a formal expert group chaired by the European Commission and comprising representatives of national authorities, industry and research establishments to formulate a common EU-wide mine methane reporting protocol. This expert group should investigate existing monitoring, reporting and verification procedures for methane emissions in the coal sector (excluding lignite where fugitive emissions are known to be immaterial), evaluate these according to both their practical application and accuracy, before proposing a common EU methodology that meets also the common reporting standards of the UNFCCC.[11]

Any EU legislation on monitoring and mitigation of methane emissions from the coal sector should be "light touch" to avoid unintended consequences. While the coal industry remains important for steelmaking and power generation in the EU, member states are balancing this need for coal with climate policy objectives which mean phasing out coal. With some phase-out plans already in place and others being developed, any legislation should complement these plans. Over regulation at this stage could be economically disruptive and merely increase imports of steam and coking coal.

26 April 2021

[11] IPCC (2006), *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds), Institute for Global Environmental Strategies (IGES), Japan.