INQUIRY INTO COAL MINING INDUSTRY SAFETY

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Submission to the Inquiry into Coal Mining Industry Safety
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(Brief biographical statement attached)

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Preamble

This submission is addressed to the inquiry term of reference 2(c):

> *Options for achieving the intent of the recommendations made by the BoI to the coal mining industry*

T**he submission covers two matters:**

(i) the role of parent companies (a longer section)
(ii) the issue of lead/lag indicators (a shorter section)

Principal recommendations in this submission

1 The Coal Mining Safety and Health Act should be amended to ensure that parent companies have an explicit obligation to deploy centralised technical functions answering to the top of the corporate hierarchy**.**

2 Resources Safety and Health Queensland should scrutinise company bonuses to ensure that, where there is any potential for a methane gas explosion, the frequency of exceedances is explicitly and separately included in bonus schemes.

(i) The role of parent companies

Many of the recommendations of the BoI were addressed to "mine operators and parent companies". For example, recommendation 10 in the first report specifies

> *Mine operators and parent companies ensure adequate spare capacity in goaf drainage systems, above the predicted maximum methane emissions.*

The importance of these recommendations is that they implicitly acknowledge that there are various levels of management above the mine that are or should be accountable for critical safety measures. Grosvenor mine, which in 2020 suffered an explosion seriously injuring five men, is owned by Anglo-American Metallurgical Coal (AAMC). AAMC is owned ultimately by Anglo American plc, (publicly listed company), with headquarters in London. The Board reports say little about the organisational structure of these parent companies and how they might respond to the intent of such recommendations. This submission provides a way mine operators and parent companies can respond to the intent of Board recommendations. The following material is condensed and slightly revised from my book *Sacrificing Safety*. Evidentiary sources will be found in chapter 7 of that book.

The contribution of Anglo's organisational structure to the Grosvenor accident

Anglo American's production imperative was driven relentlessly from the top of the corporation in London. It permeated the whole corporation and ensured that Grosvenor mine would be constantly bumping up against the limits of the ventilation and drainage system and that it would be plagued by what were viewed as nuisance gas exceedances. The explosion was the ultimate result. The problem was that there was no comparable countervailing organisational pressure to highlight the dangers of exceedances, or to combat the confusion that existed around critical controls, or to ensure that rare but catastrophic events were given special attention. Putting this another way, the mine management was constantly being held accountable for the production, via monthly performance reviews and by the system of remuneration, but there was no corresponding mechanism holding management accountable for how well it was managing the risk of methane gas explosion. What was needed was a corporate function, answerable to the CEO, with particular responsibility for ensuring that catastrophic risks, such as methane explosion, were being properly managed. Anglo has such a function, but evidently it failed to influence the management of catastrophic risk at Grosvenor. The following paragraphs examine why it failed.

To begin with, we need to examine Anglo American's organisational structure. It consists of a series of separate, quasi-autonomous businesses, coordinated by a corporate centre, but not closely controlled by that centre. These business units are as follows:

- De Beers
- Base Metals
- Platinum Group Metals
- Bulk Commodities and other Minerals (Iron Ore, Coal, Nickel and Manganese).

AA Metallurgical Coal is part of the Bulk Commodities group of businesses. It is headquartered in Brisbane and can be described as Anglo's Australian business unit. The CEOs of the four business units listed above sit on Anglo American's Group Management Committee presided over by the CEO. Also sitting on this committee are the directors of various other corporate functions, specifically:

- marketing
- finance
- human resources
- business development
- corporate relations
- legal
- technical and sustainability

The last of these functions — technical and sustainability — is the one of interest here. The technical director has accountability for matters relating to ''safety, health, environment, supply chain and operational risk''. Operational risks include catastrophic risks, which are defined as ''very high severity, very low likelihood events that could result in multiple fatalities or injuries. . . and have significant financial consequences''. It follows that the ''technical and sustainability'' function is accountable for top, corporate-level oversight of the risk of methane explosion at Grosvenor. Moreover, Anglo global claims it takes catastrophic risks very seriously. An annual report states that ''very high impact but very low frequency risks are treated with the highest priority''. It also notes that for catastrophic and operational risks, our risk appetite for exceptions or deficiencies in the status of our controls that have safety implications is very low. However, the history of exceedances at Grosvenor demonstrates that whatever Anglo says about the risk appetite of the global corporation, the risk appetite of its Australian business unit was very different. To understand why there was such a discrepancy, we need to consider how the corporate technical and sustainability function discharged its responsibility.

The technical group at head office in London is responsible for the development of global or group standards. One of these standards is ''Prevention of Underground Gas and Coal Dust Explosion Standard''. But the corporate function in London does not directly enforce these standards. Nor is it accountable for any non-compliance. Anglo American's position is as follows: "The role [of the corporate functions] is to set the performance expectations we have of operations, offer expert advice and support services to operations facing complex challenges, and monitor the effectiveness of critical programmes". It is for each business unit to build relevant standards into business-specific programs, known as an Operating Management System in the case of Australian business unit. This is done with the help of technical experts, located in Brisbane. These experts are accountable to the CEO of the Australian business unit, not to any higher-level technical authority. Moreover, the technical group in the Australian business unit does not exercise control at the mine level. Ultimate decision-making authority

at that level lies with mine management. The technical specialists in Brisbane can advise and challenge, but they do not have the ultimate say. Finally, technical specialists at the mine site, such as the ventilation officer, are directly answerable to site management and not to technical experts at head office in Brisbane. They do have lines of communication with technical experts in Brisbane, sometimes represented on organisational charts as dotted lines. But these communication lines in no way diminish the authority that mine management exercises over them.

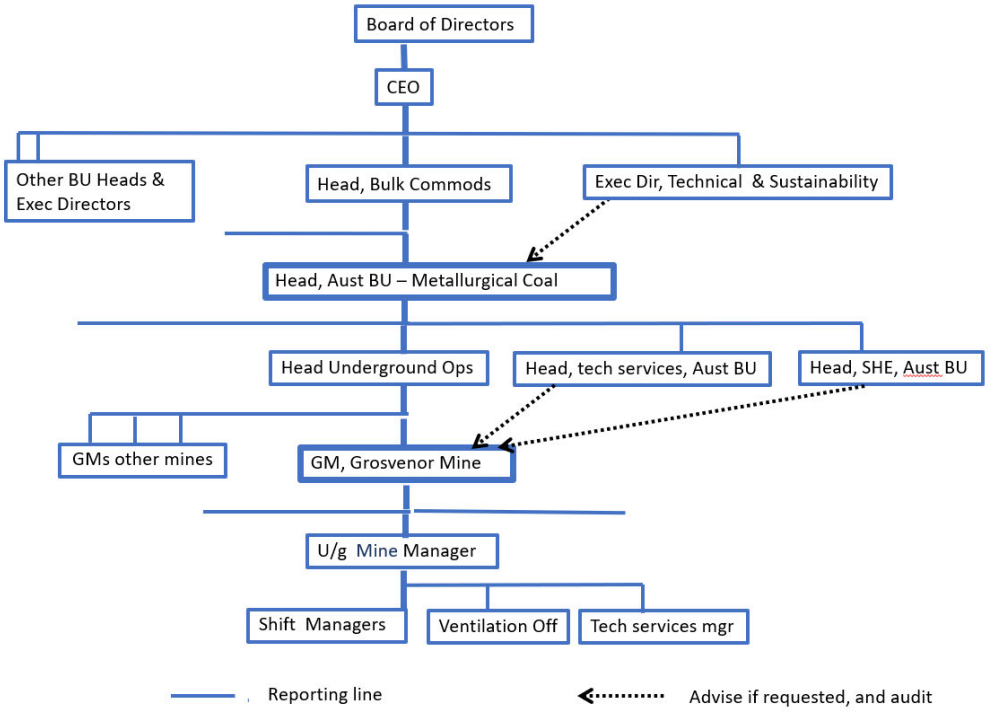

Figure 1: Simplified AA org chart at time of explosion, showing relationships of interest

All this is represented in Figure 1. This is a is a highly simplified version of Anglo's organisational chart, designed to show only the relationships of interest in the present discussion. Moreover, it is based on incomplete information and may not be entirely accurate, but it suffices for present purposes. The main line of accountability is the commercial line, running downwards from the CEO and Board. The technical positions are off to the side and somewhat isolated from each other. They are advisory positions, with no organisational authority of their own. An important instance of the lack of decision-making authority of the technical experts in Brisbane came to light during the inquiry. Given that the P seam above the target seam had not been adequately pre-drained of methane, the mine needed to devise an effective strategy for post-drainage. The head of technical services in Brisbane recommended that three lateral (horizontal) holes be drilled through the P seam, above the target seam. This would contribute to the removal of the gas when the P seam relaxed into the goaf after the longwall had passed by underneath. The mine's GM accepted this recommendation and included it in an action plan. However, a subsequent risk assessment carried out by the mine concluded that only two laterals were necessary. And when it came to the point, as a result of time pressures, one of these laterals was abandoned part way through, and the other was not even begun. This was one of the reasons the goaf was dangerously full of methane as the

LW104 was being extracted. What seems to have happened is that the advice of the technical expert in Brisbane was overridden by the mine's management, in order to maintain the production schedule. We can assume that the technical expert was not responsible for the progressive abandonment of his advice.

The situation of the ventilation officer (VO) is also worth noting. In Queensland VOs have safety responsibilities under the Coal Mining Safety and Health Act. Theoretically this should strengthen their ability to resist commercial pressures of line management. However, the Act also says that they must be "subject to the direction and control of the underground mine manager". This entirely undercuts their ability to act independently of the underground mine manager. The underground mine manager, himself, also has safety responsibilities under the Act. But it must be borne in mind that he is under constant pressure from his superiors to maximise production. This meant that ventilation officers often felt unsupported in their efforts to discharge their statutory obligations. Not surprisingly, Grosvenor mine found it difficult to recruit people to this position and to retain them, once there. Grosvenor had five different ventilation officers in the 19 months prior to the accident. My inquiries indicate that appointees soon realised they didn't have the resources and influence to enable them to do job, and so, resigned.

Returning to Anglo's higher level technical specialists, while they have no decision-making authority, they do have an audit role. Every six months, experts from the Brisbane office audit mines to assess compliance against the operating management system. And every three years, the Anglo corporate centre audits mines with respect to the management of catastrophic hazards, such as methane gas explosion. We can conclude either that the audits failed to identify the issues that led to the Grosvenor accident or that the audit findings were not effectively implemented by line management. Either way, the system of occasional audits failed to ensure that risk of methane explosion was being managed effectively. The three-yearly corporate audits are carried out by Anglo American's Business Assurance Services, drawing on Anglo's technical experts, and they are designed to assure the Anglo Board of the effectiveness of risk mitigation across the whole corporation. This top-level scrutiny every three years is the primary way in which the corporate centre seeks to maintain visibility of how well catastrophic risks are being managed. This is a very weak link in the chain of accountability. It is not what might be expected from a company that claims that catastrophic risks ''are treated with the highest priority''. It was evidently not sufficient to deter Grosvenor from embarking on the extraction the LW104 panel with less than adequate gas drainage and less than adequate ventilation.

If we are pursuing a causal analysis of the Grosvenor explosion, it would be fair to say that the most fundamental cause of this accident was the failure of Anglo American, the global corporation, to ensure that its Australian business unit was managing catastrophic risk effectively.

Decentralised organisational structure as root cause of major accidents

Where technical positions answer to local business managers, as is the case with Anglo American and many other large companies, we can speak of a decentralised technical function. Where technical positions are organised into an independent chain of command running upwards from local operations to the top of the corporation, this can be described as a centralised function. The decentralised nature of technical or safety functions, as in Anglo American, is often seen as one of the root causes of major accidents. What is more, this is not infrequently the conclusion of the company that has suffered the accident, leading it to adopt a more centralised form of organisation. I mention three examples here.

First, in 2010, the petroleum company BP, suffered an oil well blowout in the Gulf of Mexico that killed 11 men and cost the company upwards of US$60 billion. BP itself was nearly destroyed. Many factors contributed to the accident, in particular, sloppy or ill-disciplined engineering decision-making. The drilling engineers involved were answerable to local BP business managers and their decisions were strongly influenced by the commercial interests of those managers. BP was clearly of this view. After the accident it entirely reorganised its operations so that engineers were centrally directed from head office, not by local business units. As a result, site-level engineers were answerable up an independent line. More dramatically, BP created what it called a Safety and Operational Risk function, where operational risk referred to major accident risk. This function was headed by a director in London who answered straight to BP's CEO. It had several hundred employees who were ''embedded'' in the business units and sat on management committees at various levels in those business units. Sitting on these committees enabled them to have safety input into all decisions. But they were still employees of the risk function, not the business units. Their promotion prospects and rewards were determined by superiors in the risk line, not the business line. BP thus went from being one of the most de-centralised of the major oil and gas companies to being one of the most centralised. It continues to operate this model to the present day. It has not had a major accident since, and it credits this to its centralised organisational structure.

My second example is the aircraft manufacturer, Boeing, which recently transformed its organisational structure. In 2018 and 2019, two new Boeing 737 MAXs crashed, with the loss of all on board. One of the selling points to potential purchasers of the new aircraft had been that its new flight control system would not require significant additional pilot training beyond that required for the older 737 versions. This was incorrect. Boeing had also misled the regulator on this point. The outcome was that pilots were not aware of certain features of the new system which, in two cases, led to errors from which pilots were unable to recover. In response to these accidents, Boeing ''created a centralized team overseeing product safety, and reorganized its engineering function so that technical specialists report to a chief engineer, instead of the company's business units''. These reforms were part of a US$2.5 billion settlement that Boeing reached with prosecutors. According to a lawyer involved in the case, the changes meant ''that folks that have the technical knowledge and can spot issues have a centralized way they can report them, so that they are insulated from interference by business leaders who may be more swayed by economic or bottom-line considerations''.

My third example concerns the mining company, Vale, which suffered the disastrous Brumadinho tailings dam failure in its in Brazilian iron ore operations in January, 2019. An independent investigation into the causes of the accident, led by a Judge Northfleet, is relevant for all global mining companies, including Anglo American. Vale was organised into autonomous business units — Iron Ore, Basic Metals, Fertilisers and Logistics. Each was a major business in its own right. In addition, there were corporate-wide functions such as internal audit, legal and compliance. The business units minimised their dealings with these functions and operated as ‘‘silos’’, which the Northfleet report defined as ‘‘business units that operate in relative isolation from each other and of corporate support units’’. The report notes that geotechnical and risk management services for the Iron Ore division were provided by groups within that division. There were 2 such groups — operations geotechnical services, which managed tailings dams on a day-to-day basis, and a geotechnical risk management group, which operated at a higher level. This second group might have functioned as an expert second line of defence, overseeing the decisions of the frontline geotechnicians, except that it answered to the same Iron Ore business unit management. In other words, it was located within the same silo and unable to operate independently of it. It is worth quoting the report directly on this: “[The shortcomings that led to the accident] could have been minimised if there had been a second line of defence for geotechnical issues that was not subordinated to the same Executive Director.” This line would have needed to culminate in an independent executive director with accountability for geotechnical risk and the resources necessary to carry out this function. This is not the only contributing factor discussed in the Northfleet report. But the report highlights this issue, and it clearly saw Vale’s siloed organisational structure, with all that entailed, as a fundamental cause of the accident.

These and other examples support a conclusion that Anglo American’s decentralised organisational structure contributed significantly to the Grosvenor accident.

Constructing countervailing organisational pressure

In light of the preceding analysis, Figure 2 shows how Anglo American might be better organised to manage major accident risk. I have anchored the discussion to the circumstances of Grosvenor, but the model is clearly generalisable.

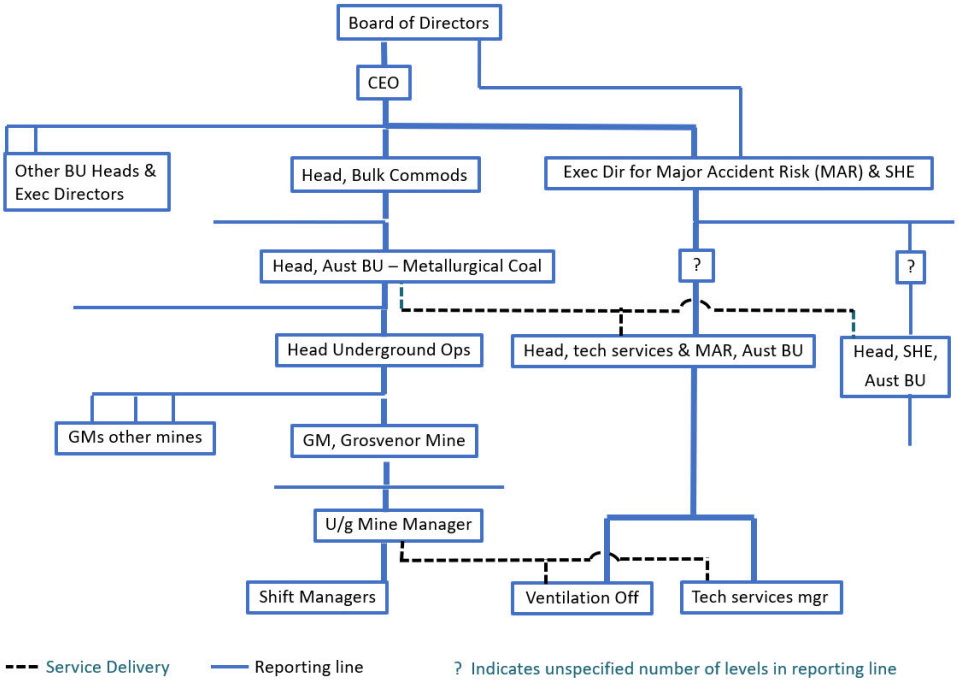

Figure 2: Proposed org structure for the management of catastrophic risk at Grosvenor

Figure 2 requires considerable explanation. It is useful to start by comparing it with Figure 1. In both diagrams the main line of accountability (reporting line) runs vertically from the Board and CEO down to shift managers. In Figure 1 this is the only line of accountability. All technical positions report sideways into this line. But in Figure 2 the technical positions are organised into a second reporting line. We can describe this as a centralised technical function, because it reports to the corporate centre. People in these positions report to higher-level technical people and their bonuses and indeed career prospects depend on how they are evaluated by their supervisors in this line. Realistically, these supervisors will solicit input from the managers to whom the services are provided, but it must be the technical supervisors who have the final say.

The question then is: how do these two reporting lines relate to each other? The dashed lines represent the relationship. Technical positions provide services to the commercial line. They are co-located (embedded) with the business unit, providing services as required by the unit.

The dashed lines are drawn in such a way as to suggest that these technical managers sit on the management team of the relevant leader, along with other line managers. This should provide them with the ability to influence outcomes when there are differences of opinion. Moreover, if necessary, they are able to escalate matters to their supervisors in the technical line which enhances their influence to the point where it amounts to authority. This is a vital feature of the decision-making process that would have stood in the way of some of the more commercially oriented decisions made at Grosvenor. I shall develop this idea of escalation in a moment.

To take account of the principles sketched above, the detailed organisational structure within the mine could also be adjusted. For example, coal mines in Queensland employ Explosive Risk Zone Controllers (Deputies), not shown in Figures 1 and 2. Deputies have dual roles. They are both frontline supervisors and technical specialists (in relation to explosive risk control).

Their designation as ERZ controller suggest that the latter is their primary role, in which case they should be primarily answerable up the technical line. It might be appropriate to divide the dual functions and appoint another person as supervisor, answerable up the commercial line.

Another feature of Figure 2 is that major accident risk (MAR) is now explicit. It is implicit in Figure 1 in the term ‘‘sustainability’’, but in Figure 2 sustainability is subdivided into two parts — MAR and SHE (Safety, Health and Environment). This is exactly the organisational design adopted by BP after the Deepwater Horizon accident. These two are separated organisationally as one moves down the chart, reflecting the very different skill sets they require. What these lines have in common is that neither is primarily concerned with the commercial interests of the business unit in which they are embedded, but rather with the sustainability values that most large corporations profess. They are complementary to each other, rather than in tension. This means that an executive director accountable for both does not have to trade-off one against the other. In contrast, in Anglo’s present organisational structure, the heads of business units are accountable for safety in all its forms, and also for profitability. Situations will inevitably arise where there is a conflict between these goals, as was demonstrated so clearly at Grosvenor, where safety was sacrificed to production.

The organisational structure described in Figure 2 does not eliminate the need for trade-offs between production and safety, but it ensures that they can be escalated, if necessary, to the top of the corporation — the CEO. This is such a vital point that it needs elaboration. It is important that the tension between production, on the one hand, and safety or risk control, on the other, be manifested at the highest level, with these two goals championed to varying degrees by different people. In situations where chief operating officers and business unit leaders may tend to give greater emphasis to production or profit, an executive director for MAR and SHE must be able to argue unequivocally on the other side. Where there are significant differences of opinion, it will be the CEO who makes the decision, but with the benefit of hearing the arguments on both sides. For this arrangement to be effective, the executive director of MAR and SHE must have the same status as those on the other side of the debate, which means that, if they report directly to the CEO, so must the executive director. Without an executive director operating in this way, the tension between production and safety is buried and resolved at lower levels of the organisation, too often in favour of production.

Furthermore, boards of directors need to be able to see the tensions in the organisation and satisfy themselves that management is dealing properly with the trade-offs between these, at times, competing objectives. This requires a direct line of communication between the executive director and the board. The director must be able to raise issues with the board in a timely manner, not restricted to scheduled quarterly or annual reporting and not subject to any restrictions or oversight by the CEO. In Figure 2, therefore, the position has dual reporting lines, one to the CEO and one to the board. To maximise the autonomy of the position, the appointment should be made or confirmed by the board. This will ensure that in the final analysis the executive director for MAR and SHE is accountable to the board.

The importance of this reporting line to the board has been emphasised by a judicial ruling in the United States allowing investors to sue the Board of Boeing for its failures in relation to the 737 MAX aircraft crashes. According to the judge: “Rather than prioritizing safety, defendants [the Board] lent their oversight authority to Boeing’s agenda of rapid production

and profit maximization." The judge also criticised the Boeing Board for lacking a safety-reporting process and then ''turning a blind eye'' once a problem emerged. According to one legal commentator, the finding is likely to have broader influence in other corporate boardrooms as company leaders consider what director-level safeguards they might need to avoid major risks. Finally, the Boeing tragedy highlights the importance of the board having access to risk information that is independent of the CEO, precisely as represented in Figure 2

It should go without saying, but unfortunately needs to be emphasised, that incentive arrangements of people in the technical lines in Figure 2 should be based on their contribution to relevant sustainability goals and not in any way on the corporation's commercial success.

In summary, a powerful centralised technical function operates as an internal regulatory body to ensure that the prevention of major accident events is treated as the top priority that Anglo and many other major companies claim it to be.

Implications for the terms of reference of this inquiry

The centralised technical function envisaged in Figure 2 is the key to ensuring compliance with some of the BoI's critical recommendations, in particular those directed to "mine operators and their parent companies" such as R10, in the first report, which requires that:

Mine operators and parent companies ensure adequate spare capacity in goaf drainage systems, above the predicted maximum methane emissions.

A centralised technical function is also necessary to ensure compliance with any of the Board's recommendations where an accountable person is not clearly identified, for example, recommendation 1 in the second report, which is addressed to "Grosvenor mine management". Unless parent companies are organised to assure compliance, such recommendations are unlikely to be effectively implemented.

Legislative recommendation

The Coal Mining Safety and Health Act should be amended to ensure that parent companies have an explicit obligation to deploy centralised technical functions answering to the top of the corporate hierarchy.

(ii) lead and lag indicators

There are two recommendations about lead/lag indicators in the Board's first report:

R23 The industry gives lead safety indicators greater weight than lag safety indicators when measuring safety performance

R24 The industry gives lead safety indicators greater weight than lag safety indicators in the determination of safety bonuses.

In making these recommendations the Board has adopted the lead/lag terminology used by its witnesses. Unfortunately, there is a great deal of confusion in the use of these terms, particularly when it comes to process safety or major accident risk. This confusion is present in the Board's recommendations. The purpose of this section of the submission is to reformulate these two recommendations in ways that achieves their intent. The following material is condensed and revised from *Sacrificing Safety*. Evidentiary sources will be found in chapter five of that book.

The first problem is that so-called lead indicators are often tenuously related, or entirely unrelated, to major accident risk. For example, one commonly used indicator is based on the number of safety observation cards filled out by the workforce each week. This leads predictably to very low-quality observations of little use in accident prevention. Another frequently used indicator is based on the number of ''visible felt leadership'' engagements (leaders going into the field to talk to workers). However, these, too, may be entirely unrelated to major accident risk. In the case of the blowout in the Gulf of Mexico in 2010, senior leaders were on the drilling rig, on a "felt leadership" engagement, asking about slips, trips and falls, at the very time that drillers were taking the series of disastrous decisions that culminated in the blowout. These leaders were still on board when the blowout occurred. Evidently their felt leadership had no bearing on how the rig was dealing with catastrophic risk.

A second problem is that the distinction between lead and lag can be quite arbitrary. Suppose we were to use number of methane exceedances as an indicator of methane explosion risk. Would this be a leading or lagging indicator? It is leading, in that it measures the effectiveness of certain risk controls. It is lagging, in that it measures the number of unwanted events. But whether it counts as a leading or lagging indicator is irrelevant. What is relevant is that it is an indicator of how well the risk of methane gas explosion is being controlled.

Third, there is a simpler and more intuitive way to think about these exceedances. They are precursor events —precursors to an explosion. Obviously, not all exceedances give rise to an explosion, but each exceedance represents an occasion of heightened explosion risk. The number of such events is therefore a measure of how well the risk of explosion is being controlled. Where the number is significantly more than zero, it can be used to monitor changes in risk level over time and companies can set about driving the number downwards.

One of the best examples of the precursor event strategy can be found in air traffic control (ATC) organisations. The most dreaded unwanted event for ATC is a mid-air collision.

Accordingly, ATC specifies the separation between aircraft that must be maintained. The failure to maintain the specified separation is called a *breakdown of separation*. It is a precursor to a collision. A breakdown of separation does not mean that aircraft are dangerously close; it means simply that they are closer than they should be, that one or more controls has failed and that, although the risk of collision may still be extremely low, it has increased. ATC therefore treats the number of breakdowns of separation as an indicator to be closely monitored. Any increase in the number is treated as a matter of great concern.

Identifying and monitoring precursor events is critical for the prevention of major accidents. If Grosvenor mine had been more alert to and responsive to exceedances, the accident in question would almost certainly have been avoided.

So to summarise, the problem with the way industry currently measures safety is not that the balance of lead and lag indicators is wrong, as suggested by the Board's recommendations; it is that there are no indicators at all of how well methane explosion risk is being managed. R23 could therefore be reformulated as follows:

> *When measuring safety performance, the industry should give greater weight to indicators that demonstrably relate to major accident risk. Frequency of exceedances would be one such measure.*

R 24 is the application of R23 to bonuses. The problem here is that as soon as indicators are made to matter by inclusion in bonuses, the initial response is to manage the indicator, not the risk. In particular there will be a strong tendency towards non-reporting wherever that is a possibility, as well as other forms of manipulation, such as the re-classification of incidents. The reporting of many HPIs (High Potential Incidents) is very vulnerable to these processes. However, the occurrence of an exceedance is recorded automatically and is more difficult to suppress or ignore. From this point of view exceedances are better suited to inclusion in bonus arrangements than many other types of HPI or any summary measure of HPIs. For this reason, it would be best to reformulate R24 as follows:

> *Where there is any potential for a methane gas explosion, the frequency of exceedances should be explicitly and separately included in bonus schemes. There should be no financial incentives to reduce the number of HPIs generally.*

Recommendation to Resources Safety and Health Queensland (RSHQ).

RSHQ should scrutinise company bonuses to ensure that where there is any potential for a methane gas explosion, the frequency of exceedances is explicitly and separately included in bonus schemes.

Biographical statement

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Andrew was an expert witness at the Royal Commission into the 1998 Exxon gas plant explosion near Melbourne. He was a consultant to the US Chemical Safety Board in its investigation of the BP Texas City Refinery disaster of 2005, and also for its investigation into the BP Gulf of Mexico oil spill of 2010. He has written books about these accidents as well as books on the Moura, Gretley, and Grosvenor coal mine disasters (see below). Over 100,000 copies of his book have been sold.

He has been involved in reviews of Work Health and Safety regulation and regulators and has done consultancy work for major companies in the mining, petroleum, chemical and electrical industries, as well as for Defence. He speaks regularly to audiences around the world about the human and organisational causes of major accidents.

- BSc and MA (Sociology) from Australian National University, PhD (Sociology) from the University of Connecticut.
- Winner of the 2008 European Process Safety Centre safety award, the first in time it was awarded to someone outside Europe.
- Honorary fellow of the Institution of Chemical Engineers in recognition of his "outstanding contributions to process safety and to the analysis of process safety related incidents"
- Life member of the Australian Institute of Health and Safe and recipient of its highest award for "lifetime achievement".
- Officer of the Order of Australia (AO) in recognition of his "distinguished service to industrial safety and accident analysis"
- Member of the advisory board of NOPSEMA – the Australian National Offshore Petroleum Safety and Environmental Management Authority

Books by Professor Hopkins:

Making Safety Work (Allen & Unwin, 1995)
Managing Major Hazards: The Moura Mine Disaster, (Allen & Unwin, 1999)
Lessons from Longford: The Esso Gas Plant Explosion (CCH, 2000)
Lessons from Longford: The Trial. (CCH, 2002)
Safety, Culture and Risk (CCH, 2005)
Lessons from Gretley: Mindful Leadership and the Law, (CCH, 2007)
Learning from High Reliability Organisations (CCH, 2009). Edited
Failure to Learn: the BP Texas City Refinery Disaster (CCH, 2008)
Disastrous Decisions: Human and Organisational Causes of the Gulf of Mexico Blowout (CCH 2012)
Nightmare Pipeline Failures: Fantasy planning, black swans and integrity management. (CCH 2014) with Jan Hayes
Risky Rewards: The Effect of Company Bonuses on Safety (Ashgate,London,2015) with Sarah Maslen
Quiet Outrage: The Way of a Sociologist (CCH: Sydney, 2016)
Organising for Safety: How Structure Creates Culture. (CCH Sydney, 2019)
Credibility Crisis: Brumadinho and the Politics of Mining Industry Reform (CCH, Sydney, 2021), with Deanna Kemp
Sacrificing Safety: Lessons for Chief Executives (CCH Sydney, 2022)