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Dealing With Catastrophic Safety and Environmental Risks: Lessons From the Global Financial Crisis

Professor Andrew Hopkins, Australian National University
(contact Andrew.Hopkins@anu.edu.au)

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Address for correspondence

National Research Centre for OHS Regulation
Regulatory Institutions Network
School of Regulation, Justice and Diplomacy
ANU College of Asia and the Pacific
Coombs Building No. 8
Cnr Fellows and Garran Road
The Australian National University
Canberra, ACT, 0200

Email: nrcohsr@anu.edu.au

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Introduction

The Global Financial crisis of late 2008 was generated by years of risky behaviour in the finance industry. These risks had paid off for myriads of decision makers in the short term, but the long term consequence was financial catastrophe. Since 2008 a number of ideas have emerged about how to alter the incentive arrangements for finance industry decision makers, in such a way as to make them more concerned about the longer term consequences of their behaviour. The argument of this paper is that these ideas have direct relevance for the management of catastrophic *health, safety and environmental* (HSE) risks, and thus for the prevention of disasters such as the blowout in the Gulf of Mexico in 2010. The paper begins by describing the way incentive systems contributed to the Global Financial Crisis (GFC) of 2008.

Remuneration in the Finance Industry

The finance industry links individual remuneration to financial performance in various ways. Two contrasting cases are prominent in the literature. The first is where individual earnings are directly linked to individual financial performance by means of bonus pay. The most extreme form of this is where people are paid entirely on commission. The second case is where senior officers are paid in part with share options. Most employees are not in a position to influence the share price by their own activities, and for them share options have no particular value as an incentive. For officers who are sufficiently senior to influence share prices by their own decision making behaviour, the use of share options as remuneration can provide a powerful incentive to maximise company profit.[1] There are of course other ways in which in remuneration can be linked to financial performance, but it is convenient to restrict attention to these two cases here. I consider them in turn, dealing first with the extreme form of bonus payment – payment by commission.

Commissions

The subprime mortgage crisis in the United States was a major driver of the GFC. Subprime loans are loans "that do not require the same high standards for income, assets and documentation of income and assets that are required for" traditional or prime loans (Yeh, 2010:111). Borrowers in such circumstances are more likely to default and these loans are therefore inherently riskier. The subprime mortgage brokers were paid on the basis of the volume of loans they could generate, and many mortgage brokers grew rich quickly by luring people into borrowing money they could not afford. Such mortgages were often bundled up subsequently as a "mortgage backed security", an interest bearing security, and sold to a new and unsuspecting investor. That investor

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[1] Both types of remuneration stem from classic agency theory, which assumes that the best way to ensure that agents (for example managers or sales people) behave in ways that are consistent with the interests of the principals (for example shareholders) is to ensure that the economic interests of agents are aligned with those of the principals. Of course people are motivated not only by economic considerations but also by job satisfaction, the opinion of others, values, and a variety of other considerations. The argument to be advanced in this paper is that, in so far as people are motivated by economic incentives, it is better to have those incentives working in favour of safety rather than against it.

usually did not understand that the security was based ultimately on sub prime mortgages that were anything but secure.[2] When the bubble broke,[3] borrowers who were unable to meet repayments had their houses repossessed and sold at much reduced prices and security holders found their securities much reduced in value. There was financial pain all around, except for the mortgage brokers who retained their original commissions. This was a remuneration system which, as Yeh (2010:112) comments, gave brokers "no incentive to consider the consequences of their action in contributing to the meltdown".

Share options

At the other end of the spectrum are the share options paid to senior company officers. This system is based on the fact that companies can hold shares in themselves (an Alice in Wonderland idea, if one thinks about it for a moment). The result is that company-owned shares can be used to remunerate employees. In particular, employees who are to be remunerated at time 1 can be given the right to buy company-owned shares at a later time, at the price that prevailed at time 1. If the market price goes up after time 1, the employee can buy the company-owned shares at another time, say time 2, and immediately sell them on the open market at the price prevailing at time 2, thereby yielding a profit. This form of incentive aims to ensure that the most senior executives of the company take decisions that maximise shareholder value.

However there is problem in this strategy. Senior executives may manipulate the share price in such a way as to maximise the value of their shares at the time they are seeking to exercise their share options, which may be in the relatively short term. In so doing they may be making decisions that are not consistent with the longer term interests of the company and its shareholders. As Bebchuk and Fried (2010:6) put it, "executives may enter into transactions that improve the current bottom line but create large latent risks that could cripple the firm in the future". Yeh provides the example of Lehman Brothers to demonstrate this kind of behaviour. Lehman Brothers, which collapsed in late 2008, had transferred its risky investments to another company controlled by Lehman. Lehman was still exposed but this was not obvious to shareholders. The company looked financially healthier than it was and its share price remained higher than it would otherwise have been (Yeh, 2010:104). Whilst there is no evidence in the Lehman case that the behaviour was motivated by a desire to maximise the value of share options in particular, it certainly had that effect. Moreover there is good evidence that, in general, senior officers actively manipulate share prices in order to maximise the value of their share options.[4]

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2 The initial house mortgages were rated BBB but the bundle was rated AAA on the assumption that while some BBB mortgages might fail, most would not and therefore the package was AAA. This thinking did not deal with the possibility that mortgage failure might occur on a large scale for systemic reasons (Yeh 2010:113). In addition, as Yeh points out, the rating agencies had an incentive to give these mortgage-backed securities a AAA rating, in order to ensure continuing business.

3 The concept of the bubble seems very apt. Yeh points out (2010: 122) that large financial institutions borrow and repay billions of dollars every day. If lenders lose confidence in an institution for any reason it can go bankrupt in no time. At the start of the day on March 13, 2008, Bear Stearns had $18billion in cash. By the end of that day it had become insolvent.

4 See references in Bebchuk and Freid, 2010, p25

The conclusion drawn by these authors is that governments or regulators should intervene in executive pay arrangements to ensure that they do not have the undesirable consequences described above. The US Secretary of the Treasury is on record making this point:

> [R]egulators must issue standards for executive compensation practices across all financial firms … [that] encourage prudent risk-taking … and should not otherwise create incentives that overwhelm risk management frameworks (Bebchuk and Freid, 2009:2).

The US Secretary of the Treasury obviously had in mind *financial* risk management frameworks, but the point is equally valid in relation to safety risk management frameworks, as we shall see shortly.

Catastrophic Safety and Environmental Risk

Consider now the issue of catastrophic safety and environmental risk. I shall develop the argument initially by reference to the BP Texas City Refinery disaster of 2005 in which 15 people were killed[5]. The investigation by the US Chemical Safety Board revealed that a major contributing factor had been the occurrence of several rounds of draconian cost cutting. This had resulted in deferred maintenance, unwillingness to invest in new and safer equipment, cutbacks in training, and staffing cutbacks that left front line workers with inadequate supervision. All these factors were implicated in the accident. Cost cutting had been going on, not only at the refinery, but throughout BP generally. Driving down costs increased profit, and hence return on investment. The greater the return on investment the higher the share price. Managers at Texas City regarded the cost cuts as unsustainable - they knew that the plant was being run down - but made the cuts anyway.

The company did not suffer any consequences from this behaviour for several years because major accidents are rare events. Poor training, poor maintenance and so on are "latent" problems (Reason, 1997:10). They lie dormant until a particular set of circumstances occurs, at which time they combine with catastrophic consequences. Putting it another way, cost cutting had increased the risk of a catastrophic failure and it was only a matter of time before this happened.

In the short term, cost cutting paid off for the corporation by driving its share price ever higher. However, this was not in the long term interests of shareholders. In the two years following the Texas City accident, BP's shares substantially underperformed all its competitors. In effect, the measures taken by the company to increase return on investment by cutting costs were detrimental to shareholders' interests.

Before moving on I note that the genesis of the Texas City Refinery accident is not unique to BP. Many major accidents can be traced back to cost cutting measures that took place in order to maximise profits (Rasmussen, 1997; Reason,1997).

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[5] All the material on BP Texas City is drawn from Hopkins (2008), where full references will be found.

Remuneration in BP

Consider now the incentive systems in use at BP. Just as in the finance case we can distinguish two types: bonus systems and share options.

The bonus system

BP operated a bonus scheme that it called its variable pay plan. For front line workers at Texas City, about 6% of their pay was bonus pay, while for managers the bonus amounted to a somewhat higher percentage of their remuneration. One big difference between this bonus system and the commission system described earlier is that the bonus was not determined by individual effort but rather by the performance of the business unit as a whole. It was thus a collective rather than an individual incentive. The bonus depended largely on the site's performance with respect to cost reduction. In short, the bonus system gave strong encouragement to cost cutting initiatives. There was no countervailing incentive to ensure that catastrophic risks were being appropriately managed.

The share option system

Senior BP managers are rewarded not only with bonus pay, as described above, but also with share options. Just as in the finance industry, this encourages the most senior managers to maximise the short term share price by cutting operating costs and, in addition, deferring capital expenditure that might be necessary in the interests of plant integrity. Such expenditure can generally be deferred without any immediate and obvious consequences for safety, although the long term consequences may be catastrophic. There is no evidence that the senior BP executives manipulated the share price[6] as cynically as happened the finance industry, at the expense of other shareholders, but it is clear that the that this was a system that encouraged them to take the short term view and discount longer term risks, exactly as happened in the finance industry.

In this analysis I have used the case of BP because a good deal of information about its incentive systems came to light in the inquiries that followed the BP Texas Refinery disaster. However, the incentive mechanisms discussed are common in industry and the principles are therefore quite general.

It is clear then that there are important similarities between catastrophic finance risk and catastrophic HSE risk. In particular, there are striking similarities in the way remuneration systems encourage employees at all levels to take a short term view with respect to both types of risk.

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6 In 2003 BP was convicted of manipulating the prices of commodities, in such as way as to boost profits.

Incentive Schemes Recommended for the Finance Industry

Given the similarities identified above, it makes sense to examine some of the solutions that have been proposed in the finance sector for their relevance to catastrophic HSE risk. Consider first the issue of share options.

Share options

The Director of the Program on Corporate Governance at Harvard Law School, Lucian Bebchuk, together with various colleagues, has proposed a system that would curtail the ability of senior executives to choose the time at which they exercise options and sell the shares so acquired. They propose, first, that executives should not be free to exercise their options in the year they are earned but should be required to wait for a period of years, perhaps seven years. Even if they leave the firm they would still need to wait the seven year period. This would give them an interest in the long term financial well being of the firm. A number of firms have already adopted this model of deferred share options, some going so far as to prevent executives from exercising their option rights until they retire (Bebchuk and Fried, 2010:9).

Bebchuk argues, however, that this is not enough. Long serving executives, perhaps at the point of retirement, who wished to cash out a large quantity of options that they had had for seven or more years, would still have an incentive to manipulate the market price by means of various short term strategies so as to maximise the value their shares at the time of sale. To remove this incentive, Bebchuk's second recommendation is that schemes be designed so that executives can only cash out their options gradually, over a period of years.

Bonuses and commissions

The incentive effects of bonuses and commissions in the finance industry have been addressed by Yeh. In fact his proposals go beyond bonuses and commissions to cover remuneration in general. He suggests that all remuneration above $100,000 and 20% of remuneration below $100,000 should be held back, by law, and converted to share options. The employee would be entitled to cash out 20% of the options in each successive year after they were earned, so that the full value of options would not be realised for five years. Remuneration earned each year would be deferred in this way. Firms that are not traded on the stock exchange would be required by law to hold the delayed remuneration in a capital fund that would be drawn on to pay out breach of duty claims against the firm. Such a mechanism would be analogous to the capital accounts that law firm partners maintain in order to satisfy claims against their partnerships. It would give all employees an incentive to act prudently and also to ensure that fellow employees are acting prudently. As Yeh (2010:100) says, "delayed compensation would create powerful incentives for each professional to limit risky behaviour, and to report the risk behaviour of other individuals, so that the consequences of that behavior do not imperil the payout of each professional's compensation".

Recommendations for Hazardous Industries

The preceding ideas translate easily into industries which run catastrophic safety or environmental risks. In particular the proposal to defer the right to exercise share options for seven years could be adopted with minimal modification. It is a device that encourages the most senior executives to act prudently with respect to catastrophic risk, whether that risk be financial, safety or environmental.

Consider for a moment how such a scheme might affect a company like BP. The first point to make is that safety and environmental disasters can substantially affect the share price of even very large companies. Following the Gulf blowout of 2010, BP shares dropped dramatically. At the time of writing it has become apparent that one of the factors that contributed to the blowout was a powerful drive to limit costs. Senior executives who were attuned to the *long term* interests of the company, by a deferred share option scheme, might have had reason to be more cautious in their approach to cost minimisation and far more concerned to ensure that cost minimisation did not jeopardise the integrity of their operations.

However, it is only the most senior executives who are potentially able to be influenced by a deferred share option scheme. We need therefore to consider ways of tying remuneration more generally to the management of catastrophic HSE risk. Yeh proposed the deferral of all remuneration above a threshold of $100,000 per annum to make employees more sensitive to long term risk. A less radical step would be simply to defer the variable component of pay, the bonus, for a period of say seven years. I have chosen seven, rather than five, as Yeh proposed, simply because I suspect that it takes longer for short sighted cost cutting to generate catastrophic safety outcomes than it does for short sighted lending strategies to unravel catastrophically.

Yeh proposed two mechanisms. The first was that deferred remuneration be paid in the form of share options, already discussed. The second was that deferred remuneration be paid directly into a fund - a bonus pool - that could be drawn on to pay for damages in the event of catastrophic incidents. Such a fund might operate as a unit trust.[7] Under such an arrangement, deferred remuneration would be used to buy additional units in the trust, at the prevailing price, and units could be sold when the remuneration was finally to be realised. The value of the units at the time of sale would be augmented by any profit or interest paid to the trust between the purchase and sale of units, and diminished by any payments made by the trust to compensate for catastrophic HSE losses. Trusts would need to be set up on a conservative financial basis, much as defined benefit superannuation schemes are, and it would be advisable that they do *not* invest in the company concerned, so as to minimise exposure to catastrophic loss.

There is at least one important difference between these two proposals, that is, using bonuses to buy share options and using them to buy units in a trust. Share prices are affected not only by how well a firm is managing its catastrophic risk, but by a variety of other factors, such as change in market position and technological change. On the other hand, under the proposed unit trust scheme, unit prices will be much more directly affected by how well the firm is managing catastrophic HSE risk. The unit trust proposal

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7 A form of investment common to many UK derived legal systems. I am indebted to Kerry Jacobs, Australian National University, for this idea.

is therefore the preferred strategy from the present point of view. I will concentrate on this possibility in the following discussion.

Further Details About How a Unit Trust Scheme Might Work

Many companies trading on the stock exchange are quite diversified and operate with numerous distinct business units. It would arguably be better to tie remuneration to the performance of these business units, rather than to the performance of the corporation as a whole. To continue the BP example, it does not make much sense to include BP service station managers in Australia in the same pool as BP drilling managers in the Gulf of Mexico. Fortunately, this fine tuning is easily achieved. Bonuses paid in very large corporations are already tied to business units or other component entities of the corporation. The purpose can be achieved by simply grafting a unit trust scheme onto existing bonus arrangements. For corporate managers that sit above the business units, their bonuses would be divided among the pools of the business units for which they are responsible. This would provide the necessary incentive in relation to the business units which they have the capacity to influence.

In principle it would be desirable that all the costs of catastrophic accidents be charged to the bonus pool, including the costs of lost production. The principle here is that if people are to be rewarded when risk-taking pays off, they should be penalised in equal measure when risk-taking fails to pay off. Otherwise, there is an inherent bias in favour of risk-taking. Unfortunately, however, it is virtually impossible to calculate the full cost of a major accident. It is far simpler, therefore, to limit the payouts from bonus pools to cover the penalties and compensation awards ordered by courts or other adjudicating bodies. The $20 billion initial payout made by BP following the Gulf blowout could presumably be charged to such a bonus pool.

As the preceding example makes clear, catastrophic events have the potential to wipe out entire bonus pools. The question arises as to whether this is fair to the employees concerned. It was argued above that people who benefit from risks that are taken to enhance profits should also pay the full price when those same risks generate loses. On this basis it is reasonable to conclude that bonus pools should not be protected against very large claims. Moreover, compensation payouts are usually only awarded when the companies concerned are at fault in some way. This would suggest that there is nothing unfair about allowing a large claim to wipe out a bonus pool. However, if deemed necessary, schemes could be devised in such a way as to prevent bonus pools from being wiped out by a single event.

There may be pragmatic reasons for limiting a unit trust scheme to *uninsured* payouts. One argument for this restriction is that where payouts are insured, insurance companies are already conducting their own audits to assure themselves that the firms they insure are managing catastrophic risk effectively. Nevertheless, the logic of the scheme would argue against any such limitation.

It is impossible to distinguish in any sensible way between catastrophic and non-catastrophic events, and it would therefore not be possible to limit the scheme to catastrophic events. This would not be a significant concern, however, since payouts for

non-catastrophic events would have no appreciable effect on the bonus pool of a large company, or even one of its business units.

A scheme of this nature would mobilise safety expertise in an unprecedented way. Not only would it encourage high level professionals to give a high priority to the management of catastrophic risk in their own areas of responsibility, it would also encourage them to take an interest in what their peers were doing in other areas of the business, since a major accident in any part of the business would have an impact throughout the business. This is precisely the beneficial effect that Yeh identified in relation to the management of catastrophic *financial* risk. Moreover those who had recently retired from senior managerial and technical positions and were still awaiting final payouts from the bonus pool would have a vested interest in ensuring that their firm or business unit continued to manage catastrophic risk properly. Not only would they have an interest, they would have time to devote to ensuring that their former peers were doing the right thing. They would be well aware of the issues and they would probably be able to exercise influence by means of direct phone calls. They would constitute what Jacobs describes as a "Jesuitical corp"[8] of trusted and expert people looking over the shoulders of decision makers and keen to provide advice. This is perhaps one of the most interesting and potentially far-reaching consequences of the unit trust proposal.

Health Disasters

The focus so far has been on safety and environmental disasters. It is worth speculating about the potential for deferred bonus and share option schemes to prevent *health disasters*, such as the enormous toll of death and disease caused by asbestos and by tobacco. Both asbestos and tobacco companies have been faced with massive compensation payouts in recent years. In both cases there was evidence many decades previously of the damaging health effects of their products, which the companies ignored, indeed suppressed, as long as they could.

Suppose a bonus or share option scheme with a seven year deferment had been in place. What difference might this have made? At first glance it might appear that it would have made very little difference. When the evidence began to emerge that these products were dangerous, before World War II in the case of asbestos, court-awarded damages were still decades away. On the other hand, the decision makers at the time had no way of knowing how far into the future the first big compensation awards might be. Had a scheme been in place they would probably have begun to act on the assumption that their deferred benefits might indeed be affected. Eventually it might have proved difficult to attract good people to such jobs and these industries might have been would back much sooner than they were.

Such a suggestion involves an extension of deferred bonus and share option schemes, from industries that can experience sudden catastrophic events, to those where disasters develop over a long period of time. This raises the question of just which industries should be covered by deferred bonus and share option arrangements. In principle we would want such schemes to operate in all industries where there is a

[8] Kerry Jacobs. Personal communication. The reference goes back to Beatrice Webb who talked of public servants as a Jesuitical corps of ascetic zealots (Hood, 1995:94).

potential for disaster. In practice, however, we would need to proceed incrementally. One possibility would be to extend these arrangements to any industry where insurers are unwilling to provide insurance because of the possibility of catastrophic losses. As early as 1918, some US insurers would not offer life insurance to asbestos workers (Haigh, 2006:22), and this could have been the trigger for governments to introduce deferred bonus and share option arrangements for companies dealing with asbestos.

Bonuses for the Management of Catastrophic Risk

Earlier discussion implicitly assumed that bonus payments are based on financial performance and that the way to get employees to attend to the possibility of catastrophic risk is to ensure that these bonuses are affected when a catastrophic event occurs. However, in the case of hazardous industries, it may also be possible to make bonuses dependent on how well catastrophic risk is being managed *in the normal course of events*, regardless of whether a catastrophic event actually occurs. This is an important possibility that needs separate discussion.

I begin by noting that many companies that operate bonus schemes have decided that a small component of the bonus should be determined by safety performance. Safety is measured in terms of workforce injury rates, and the lower the rate the greater the bonus. Unfortunately, however, this does not direct attention to catastrophic risk. A site may go for many years without injuries or fatalities attributable to a catastrophic event. Such events, in other words, do not contribute to injury statistics *on an annual basis*. An organisation that is seeking to reduce its annual injury rates will sensibly focus on the hazards that are generating injuries *on an annual basis*, such as falls from height, vehicle accidents, and unguarded machinery. It will have no incentive to focus on hazards that give rise to events that are catastrophic but rare. A focus on injury statistics therefore provides little or no incentive to attend to questions of maintenance, training, supervision and so on, all of which are relevant to the management of catastrophic risk.

Interestingly, to return to the Texas City example, there *were* ways of measuring how well the Texas City site was managing catastrophic risk. One of the precursors to disaster for a refinery or similar facility is accidental release of flammable material such as gas or petrol – “loss of containment” events, in the jargon of the industry. If there is an ignition source present, such a loss of containment may cause a fire or even an explosion. Obviously, the greater the number of loss of containment events, the greater the risk of disaster. The number of such events can therefore provide a measure of how well a site is managing the risk of a major accident. Texas City was experiencing hundreds of loss of containment events annually. Indeed the number had increased by 50% in the two years prior to the disaster but this was not an indicator that mattered to the company. Such releases were not seen as having the potential to generate injuries and were not incorporated into bonus calculations. Had they been, this could have provided a strong incentive to manage long term, catastrophic risk more carefully. Inquiries following the Texas City accident strongly recommended that loss of containment events be incorporated in bonus systems.

For a variety of reasons, which will not be discussed here, it is often not possible to identify immediate precursor events that can be used as measures in this way.[9] For this reason, some companies seek to measure the management of catastrophic risk directly, and to incorporate such measures into bonuses. In particular, they assess the extent to which catastrophic risk controls are in place and working, and on this basis they calculate scores indicating how well catastrophic risk is being managed. Rio Tinto, for example, uses "semi quantitative risk assessments" to calculate what it calls "critical risk scores". Ten percent of short term remuneration for its senior executives is tied to achieving a reduction in critical risk scores.[10] Some companies have developed indicators that are a composite of major accident precursor events (like loss of containment) and measures of how well major accident risk controls are functioning.[11]

Notwithstanding these examples, there has not been a great deal of progress in measuring how well catastrophic risk is being controlled. The measures that *have* been constructed are not easily generalised. Moreover they are vulnerable to manipulation. It is sometimes far easier to manage the measure than it is to manage the catastrophic risk.[12] For this reason, the potential of this approach is yet to be realised[13] and the idea of linking bonuses to the catastrophic events themselves, as discussed earlier in this paper, seems well worth pursuing.

Conclusion

There are important similarities between the finance industry and industries that deal with major health, safety and environmental hazards. In particular, the remuneration systems that operate in both types of industry encourage a focus on short term advantage and a disregard of the longer term and more catastrophic risks. The Global

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9 There may be no consistent precursors, or they may be too vague to be counted, or they may be too few to enable a rate to be computed.

10 See Company Review by Ord Minnet, 10 March, 2010

11 Total operated such a system in Norway. Personal communication with Jan-Erik Vinnem.

12 For instance, if "percentage of audit recommendations closed out" is used as an indicator, the quantity of close outs can be increased by decreasing their quality.

13 We need to do a great deal more thinking about this. Here is one suggestion. Catastrophic risks are best dealt with by ensuring that bad news about catastrophic risk management is effectively reported up the line. Suppose every manager were required to identify the most 'helpful' bad news report in a particular period, say monthly. Helpful would be defined as being of help in minimising catastrophic risk. Suppose managers were required to report the results of their monthly deliberations about the most helpful report and suppose they were assessed and rewarded on the basis of whether or not they were engaging in this process. This would surely improve the quality of catastrophic risk management.

Another possibility is to use number of near misses as a key performance indicator in determining bonuses. The concept of near miss would need to be carefully defined and focused on catastrophic risk. Of course the propensity to report is itself influenced by incentives, and to deal with this there would need to be a two level approach. Front line employees would need to be offered incentives to report, that is to *increase* the reported rate of near misses. Senior managers, those in a position to make changes that would reduce the number of near misses, but not in a position to influence reporting, could be provided with incentives to *decrease* the number of reported near misses.

Financial Crisis has spawned a number of suggestions aimed at encouraging people at all levels in the finance industry to pay greater attention to catastrophic risk. These suggestions all involve deferring remuneration, in particular bonus pay and share options, for a period of up to seven years, to ensure that decision makers focus on the longer term corporate interest.

These ideas have direct relevance for the management of catastrophic HSE risk. First, the *deferred share option schemes* now being proposed for the finance sector could be applied with little or no modification to industries that run catastrophic HSE risks. Second, cleverly designed *deferred bonus schemes* would be an excellent way of mobilising employees at many levels to pay greater attention to catastrophic HSE risk. We cannot rely on companies themselves to implement these ideas. It will be up to the regulators of hazardous industries to take the lead.

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