



## Hazelwood Mine Fire Board of Inquiry



## High-level Assessment of Alternative Rehabilitation Financial Mechanisms

**NOVEMBER 2015**





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<b>Issued to</b>	
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# Contents

<b>Executive summary</b> .....	<b>iii</b>
<b>Abbreviations</b> .....	<b>v</b>
<b>Definitions</b> .....	<b>vi</b>
<b>1 Introduction</b> .....	<b>1</b>
1.1 Background.....	1
1.2 Qualifications.....	1
1.2.1 Firm undertaking the assignment .....	1
1.2.2 Person acting as witness .....	2
1.3 Information sources .....	2
1.4 Need for financial assurance .....	2
1.4.1 Historic legacy .....	2
1.4.2 Overview of financial assurance .....	3
<b>2 Financial mechanisms for rehabilitation</b> .....	<b>4</b>
2.1 Guiding principles.....	4
2.2 Financial instruments .....	4
2.2.1 Surety held by operator .....	6
2.2.2 Surety guaranteed by third party.....	7
2.2.3 Surety transferred to government or trust .....	8
2.3 Financial assurance systems.....	9
2.3.1 Full financial assurance systems .....	9
2.3.2 Discount financial assurance systems.....	10
2.3.3 Pre-defined liability proportion systems.....	10
2.3.4 Pooled fund systems .....	10
2.3.5 Insurance based systems .....	11
<b>3 Cross-jurisdictional review</b> .....	<b>12</b>
3.1 Victoria .....	12
3.1.1 Rehabilitation bond system for mining and extractive industries .....	12
3.1.2 Victorian Environment Protection Authority .....	14
3.2 Northern Territory.....	15
3.3 New South Wales .....	15
3.3.1 Financial assurance system and legacy mines .....	15
3.3.2 Mine subsidence trust fund .....	16
3.3.3 Coal Seam Gas industry risk review .....	16
3.4 Queensland .....	17

3.4.1	Financial assurance system .....	17
3.4.2	Audit of financial assurance .....	18
3.5	South Australia .....	19
3.6	Tasmania .....	19
3.7	Western Australia.....	20
3.8	European Union .....	21
3.9	Manitoba .....	21
3.10	Saskatchewan .....	22
3.11	Nevada.....	23
3.12	New Zealand .....	24
3.13	Extractive industries .....	25
<b>4</b>	<b>Assessment of financial mechanisms.....</b>	<b>26</b>
4.1	Adequacy of current rehabilitation bonds .....	26
4.2	Future uncertainties and risks.....	27
4.3	Assessment of financial mechanisms .....	27
4.3.1	Options assessed.....	27
4.3.2	Expected closure costs.....	28
4.3.3	Unplanned post-closure costs.....	33
4.3.4	Post-closure trust fund option .....	35
4.3.5	Estimation of rehabilitation liability.....	36
<b>5</b>	<b>Conclusions .....</b>	<b>38</b>
<b>6</b>	<b>References and personal communications .....</b>	<b>38</b>

## Tables

Table 1	Current bond and 2015 estimated liabilities.....	26
Table 2	Potential rehabilitation bond increase.....	28
Table 3	Example of multi-step increase option .....	30

## Figures

Figure 1	Australian legacy mines, July 2011 (Unger et al 2012).....	3
Figure 2	Categories of financial guarantee instruments (sourced from MonTec 2007, p. 22.) .....	5

## Executive summary

This report has been prepared for the Board of the Hazelwood Coal Mine Fire Inquiry (the Inquiry) by Accent Environmental to address Terms of Reference 10 (c):

*“Having regard to the rehabilitation liability assessments that have been or will be reported in 2015 by the operators of each of the Hazelwood Mine, the Yallourn Mine, and the Loy Yang Mine, as required by the Mineral Resources (Sustainable Development) Act 1990, and to the outcome of the Rehabilitation Bond Review Project:*

*(c) any practical, sustainable, efficient and effective alternative mechanisms to ensure rehabilitation of the mines as required by the Mineral Resources (Sustainable Development) Act 1990.”*

The primary purpose of financial assurance for mining projects is to provide a high degree of certainty that adequate funding will be available to undertake final rehabilitation in the event of default by the operator. A secondary purpose is to promote progressive rehabilitation.

A cross-jurisdictional review has identified range of different financial mechanisms used to ensure that the rehabilitation of mining operations is properly funded and implemented. A number of trends have been emerging over recent years including:

- the increased use of trust funds to enable post-closure management, including in perpetuity
- a greater focus on cost risks associated with unplanned events, particularly post closure
- the adoption of discount bond systems to reward good performance and encourage progressive rehabilitation
- the use of more sophisticated liability calculation tools and adoption of probabilistic cost estimation methods to more accurately determine rehabilitation liability.

The emergence of these trends is recognition of issues with traditional financial assurance mechanisms, such as the underestimation of rehabilitation liability, difficulties in meeting requirements for site relinquishment and problems faced by regulators in encouraging progressive rehabilitation.

Current rehabilitation bonds for the Latrobe Valley coal mines are substantially lower than the rehabilitation liability of the sites. This presents a risk to the State and sits within the context of broader issues including:

- geotechnical, hydrogeological and fire prevention risks at the three mines which result in a degree of technical uncertainty regarding appropriate methods of rehabilitation
- market uncertainty due to falling electricity demand (which has led to over supply), increasing competition from the renewables sector and the potential for future carbon pricing. Such uncertainty could result in the early closure of one of more sites.

Victoria currently has a full financial assurance system for mining projects that require operators to provide rehabilitation bonds equal to 100% of estimated liability. The State is currently implementing a performance-based discount bond system, but the coal mines are deemed ineligible due to their high rehabilitation risk.

A range of options for alternative financial mechanisms were assessed for their potential to ensure that rehabilitation of the mines is undertaken as required under the *Mineral Resources (Sustainable Development) Act 1990*. The options were:

- **Single-step increase** – a single-step increase of existing rehabilitation bonds to achieve full financial assurance coverage.

- **Multi-step increase** – a pre-defined schedule of bond increases to progressively achieve full financial assurance coverage.
- **Bond discount** – the single-step or multi step increase options with additional bond discount.
- **Trust fund for rehabilitation** – using a trust fund to provide supplementary financial assurance coverage.
- **Insurance-based coverage** – using insurance to provide supplementary financial assurance coverage.
- **Pooled fund coverage** – using a pooled fund to provide supplementary financial assurance coverage.
- **Unplanned events insurance** – using insurance to mitigate the risk of post-closure unplanned costs.
- **Unplanned events fund** – using a trust fund to provide funds for unplanned post-closure costs.
- **Post-closure trust fund** – using a trust fund to cover the costs of post-closure management, maintenance and monitoring of the sites.

A post-closure trust fund could also be used to help reduce the social and economic impacts of mine closure of the Latrobe Valley community

The greater the gap between the rehabilitation bond and the rehabilitation liability, the greater the risk taken on by the State. In considering the options for financial mechanisms the State has to assess the likelihood and consequences of rehabilitation default, its willingness to take on risk, and balance this against the commercial needs of the operators. It is up to the operators to present a case for any financial hardship that may occur from increasing the bond amounts.

It is not clear that any of the options assessed provide strong financial or other incentives for the mine operators to undertake significant progressive rehabilitation. There are inherent risks in leaving untested aspects of rehabilitation until the end of operations and it is important that such a situation is avoided in the Latrobe Valley.

# Abbreviations

CPI	Consumer Price Index
DEDJTR	Department of Economic Development, Jobs, Transport and Resources, Victoria
DPI	Former Department of Primary Industries, Victoria
DSDBI	Former Department of State Development, Business and Innovation, Victoria
DEHP	Department of Environment and Heritage Protection, Queensland
EES	Environment Effects Statement
ERR	Earth Resources Regulation Branch (within DEDJTR)
EPA	Environment Protection Authority Victoria
LYP	Loy Yang Power
LYCA	Loy Yang Complex Agreement
MCA	Minerals Council of Australia
MRSD Act	<i>Mineral Resources (Sustainable Development) Act 1990</i>
SECV	Former State Electricity Commission of Victoria,
TOR	Terms of Reference for the Board of Inquiry into the Hazelwood Coal Mine Fire, made by Order in Council on 26 May 2015
C\$	Canadian dollars

## Definitions

Board of Inquiry	The Board of Inquiry into the Hazelwood Coal Mine Fire, comprising The Honourable Bernard Teague AO (Chair), Professor John Catford and Mrs. Anita Roper.
Credit rating	An opinion of the general creditworthiness of a borrower with respect to a particular debt security or other financial obligation. Usually expressed as alpha characters with AAA being the highest rating.
Cost of capital	Refers to the opportunity cost of making a specific investment.
Declared mine	The <i>Mineral Resources (Sustainable Development) Act 1990</i> Section 7 C provides the Minister for Earth Resources with powers to declare a specific mine or quarry where there are geotechnical or hydrogeological factors within the mine or quarry that pose a significant risk to public safety, the environment, or infrastructure.
Financial assurance	A term for the financial security provided by tenement holders to government to cover the cost of rehabilitation in the event of the tenement holder's default. Equivalent to the term rehabilitation bond under the Victorian regulatory system.
Financial assurance system	The system by which a government manages risks associated with rehabilitation liability, including determining the required amounts of financial assurance, regulating the provision of financial assurance and encouraging progressive rehabilitation.
Financial instrument	In this report refers to the means by which the agreed amount of financial assurance is guaranteed to be available to the regulator in the event of operator insolvency.
Hazelwood Coal Mine Fire	The fire that took hold in the Hazelwood Mine on or about 9 February 2014.
Inquiry	The re-opened Inquiry into the Hazelwood Coal Mine Fire.
Insolvency	When liabilities exceed assets and an organisation is unable to pay its debts when and as they fall due.
Latrobe Valley coal mines	The Hazelwood Mine, the Yallourn Mine and the Loy Yang Mine.
Loy Yang Complex Agreement	An agreement made between the State Electricity Commission of Victoria (SECV), Loy Yang Power (LYP) and Edison Mission Energy Australia (EME) on 29 March 1997.
Mining	The extraction of minerals, including coal, from the land with the purpose of producing them commercially, including processing and treating ore.
Operations	The period in the life a mining operation from the granting of approval to start operations until the end of mining.
Operator	In this report, operator is used as a general term referring to the entity with responsibility for site rehabilitation and closure during the normal operation of a mining project. In different jurisdictions or circumstances, this may be the mining company, the licensee, the tenement holder.
Opportunity cost	The cost of an alternative that must be forgone in order to pursue a certain action.
Rehabilitation	Financial assurance which must be provided by an operator prior to work commencing to ensure that rehabilitation can be undertaken by the government in the event of



bond	rehabilitation default. A rehabilitation bond should also provide an incentive for licensees to comply with their rehabilitation obligations. Equivalent to terms such as financial assurance, financial security and financial guarantee that are used in other jurisdictions.
Rehabilitation Bond Review Project	The current review into rehabilitation bonds and the methodology by which they are calculated, as referred to at page 1612, lines 7–8 of the transcript of the Hazelwood Mine Fire Inquiry dated 10 June 2014.
Rehabilitation default	A failure by a tenement holder to undertake the rehabilitation required by the regulator, typically as set out in an agreed rehabilitation plan. For example, rehabilitation default occurs when tenement holders enter into receivership or liquidation.
Rehabilitation liability	The estimated cost of undertaking the rehabilitation works required for a project site to meet the standard required by government for it to be relinquished at the end of its life.
Rehabilitation plan	A plan prepared by a tenement holder setting out the rehabilitation works required for a project site to be relinquished to government at the end of its life.
Residual risks	In this report, refers to the rehabilitation risks (such as batter failure) that remain once site rehabilitation is complete and could result in unplanned post-closure costs.
Site relinquishment	The post-closure transfer of a rehabilitated site and its associated liability from the operator to the government or a third party.
Work plan	A plan approved under the <i>Mineral Resources (Sustainable Development) Act 1990</i> or endorsed pursuant to clause 21A of the Agreement set out in Schedule 1 to the <i>Mines (Aluminium Agreement) Act 1961</i> , as amended by the Amendment Agreement set out in Schedule 2 to that Act, as the case may be. A work plan contains prescribed information, a rehabilitation plan and, if necessary, a plan for community consultation.

# 1 Introduction

## 1.1 Background

In February 2014 a fire took hold in the Hazelwood Coal Mine, adversely impacting Latrobe Valley communities. In March 2014, a Board of Inquiry was established to inquire into and report on a number of specified matters relating to the fire in the Hazelwood Coal Mine. That Inquiry's report was tabled in the Victorian Parliament on 2 September 2014.

Since that report was tabled, further concerns were raised about the potential health impacts of the fire on the Latrobe Valley communities and future options for rehabilitating Victorian mines in the Latrobe Valley.

On the recommendation of the Premier under section 53(1) of the Inquiries Act 2014, the Governor in Council issued an Order in Council (dated 26 May 2015), appointing a Board of Inquiry to inquire into and report on the terms of reference specified in paragraphs 6 to 11 of the Order (GG 2015).

Terms of Reference 10 states the following:

***“Having regard to the rehabilitation liability assessments that have been or will be reported in 2015 by the operators of each of the Hazelwood Mine, the Yallourn Mine, and the Loy Yang Mine, as required by the Mineral Resources (Sustainable Development) Act 1990, and to the outcome of the Rehabilitation Bond Review Project:***

*(a) whether the rehabilitation liability assessments referred to above are adequate;*

*(b) whether the current rehabilitation bond system, being one of the measures to provide for progressive rehabilitation by end of mine life as required under the Mineral Resources (Sustainable Development) Act 1990, is, or is likely to be, effective for the Hazelwood Mine, the Yallourn Mine, and the Loy Yang Mine; and*

***(c) any practical, sustainable, efficient and effective alternative mechanisms to ensure rehabilitation of the mines as required by the Mineral Resources (Sustainable Development) Act 1990.”***

This report has been prepared for the Board of the Hazelwood Coal Mine Fire Inquiry (the Inquiry) by Accent Environmental to address Terms of Reference 10 (c) (shown in bold).

## 1.2 Qualifications

### 1.2.1 Firm undertaking the assignment

Accent Environmental Pty Ltd (Accent) is a Melbourne-based company formed in 2012 to provide environmental and social impact assessment, management services, and strategic advice to the mining, oil and gas, industrial, water and waste sectors. Accent has particular capabilities and experience in the area of mine site rehabilitation and mine closure, which is a key area of focus for the company.

Accent is supported in this assignment by Marsden Jacob, a consultancy firm that offers in-depth and independent research and analysis on economic, financial and public policy issues. Marsden Jacob was founded in 1996 in Melbourne and has since grown to become a national firm with offices in Melbourne, Perth, Brisbane and Sydney.

## 1.2.2 Person acting as witness

### **Mr. Michael Cramer, Director of Accent Environmental**

Michael Cramer is the founder and Director of Accent Environmental. He has a Bachelor of Science (Earth Sciences) with Honours from the University of Melbourne (1989) and a Master of Environmental Science from Monash University (1998).

Michael has over 20 years of experience consulting to industry and government, including project managing environmental impact assessments and preparing management plans for major projects in the mining, petroleum, water, waste and industrial sectors. He has undertaken work in both temperate and high-rainfall environments in Australia, Asia, Africa and Papua New Guinea. Michael is a qualified Environmental Social and Health Impact Assessment (ESHIA) facilitator for Chevron Corporation and is a member of the Australasian Institute of Mining and Metallurgy (AusIMM), the Environment Institute of Australia and New Zealand (EIANZ) and the Australia Africa Chamber of Commerce (AACC).

Michael has specialist experience in mine rehabilitation and closure planning working for both the private sector and government in Australia and internationally. His closure experience includes providing high level advice regarding financial assurance, assessing and managing closure liability, and preparing and costing rehabilitation and closure plans. In 2014, he was the project director for Accent's development of a reduced bond scheme for mining and extractive industry operations in Victoria with the assistance of KPMG. In 2003 he prepared a Strategic Framework for Rehabilitation and Closure Planning for the Loy Yang Mine.

## 1.3 Information sources

The following information sources were provided to Accent by the Inquiry:

- *Mineral Resources (Sustainable Development) Act Review - Stage 2, Draft discussion paper No 5 - Rehabilitation Bonds* (DEDJTR.1008.001.0232).
- Loy Yang Complex Agreement between Edison Mission Energy Australia Limited, Loy Yang Power Limited and SECV 29 March 1997 (redacted).
- Annual activity and expenditure return 2014-15 for MIN5004 (DEDJTR.1007.001.0201).
- Annual activity and expenditure return 2014-15 for MIN5189 (DEDJTR.1007.001.0223).
- Annual activity and expenditure return 2014-15 for MIN5003 (DEDJTR.1007.001.0182).
- KPMG (June 2011) Options for financial assurance for rehabilitation of mine and quarry sites, (DEDJTR.1007.001.0228).

The above sources were relied upon, in part, to prepare this report. Other sources relied upon in preparing this report are listed in the references and personal communications section (see Section 0).

In particular, references to the outcomes of the Victorian Government's rehabilitation bond review project have been sourced from *Hazelwood Coal Mine Fire Inquiry submission from the Victorian Government Latrobe Valley Coal Mines Rehabilitation* (Victorian Government 2015).

## 1.4 Need for financial assurance

### 1.4.1 Historic legacy

The need for financial assurance is illustrated by the legacy of environmental issues left by abandoned mines in Australia (see Figure 3) (Unger et al. 2012). Much of this legacy is the result of historic operations that were subject to less stringent regulatory controls and much lower government and community

expectations than projects operating today. However, even today, there are many recent or contemporary operations with substantial legacy issues.

One of the major issues requiring management by industry and regulators is the issue of premature closure. An Australia-wide study of approximately 1000 sites that closed between 1981 and 2005 found that at around 75% of site closures were premature or unplanned (Pepper et al. 2014). The potential consequence of this scenario is that the liability may fall on the State if the sites are not rehabilitated effectively.

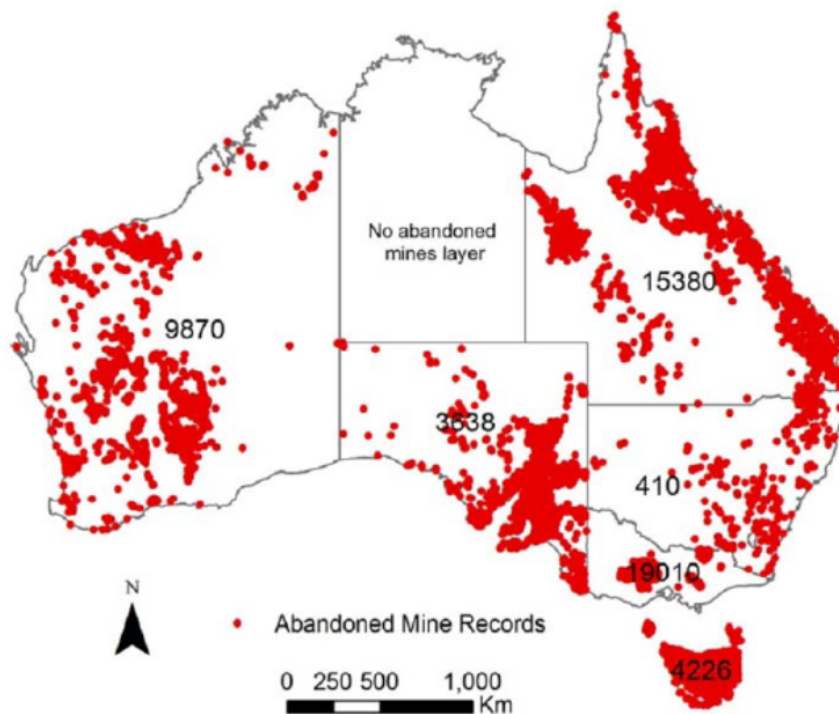


Figure 3 Australian legacy mines, July 2011 (Unger et al 2012)

#### 1.4.2 Overview of financial assurance

Financial assurance (provided by rehabilitation bonds in Victoria) helps ensure the operator responsible for mining activities is responsible for paying for the rehabilitation, even in the event of rehabilitation default due to insolvency. This avoids cost to the taxpayer and improves community confidence in the industry. However, maintaining a 100% financial assurance system to represent the true cost of rehabilitation has the negative impact of tying up money that the industry could be investing in other activities including progressive rehabilitation (Pepper et al 2014).

Financial assurance systems have commonly been criticised for understating actual mine closure costs. The only way to ensure a bond does not fall short is to develop a system that can accurately calculate the cost of mine closure and for this to be annually reviewed and adjusted reflecting performance milestones or non-compliance with any incremental mine closure requirements (Pepper et al. 2014).

There is a moral hazard associated with any system where the financial assurance is less than the rehabilitation liability. Such moral hazard can be due to a bond reduction (such as under a bond discount system), the under-valuing of liability, or where site conditions have changed since the bond was set (e.g. project expansion, or the emergence of new environmental or other liabilities). Moral hazard is also present where the financial assurance system allows for cross-subsidies between projects (DPI undated).

## 2 Financial mechanisms for rehabilitation

### 2.1 Guiding principles

The Victorian government submission to the Inquiry (Victorian Government 2015) lists ten principles for a good security bond model that were identified by KPMG. The principles were an output of a government and industry working group convened in 2011 by the then Department of Primary Industries (DPI) to explore options for bond reform. The ten KPMG principles are:

- the system should reflect the fact that a rehabilitation failure rate of 100% is unlikely
- the system cannot be a ‘no assurance’ system – this creates moral hazard
- the system should reward past good behaviour
- the system should also encourage future good behaviour and discourage future bad behaviour
- the system should be based on risk management principles
- the system should avoid cross-subsidies
- the system should attempt to avoid large and uncertain increases in the amount of financial assurance
- the Government will seek to manage its financial risks to minimise any budgetary impact
- any new model should, where possible, not materially increase the administrative burden
- financial assurance should be readily converted into cash.

The above guiding principles were included, almost verbatim<sup>1</sup>, in a subsequent DPI discussion paper *DRAFT Discussion Paper No 5 – Rehabilitation Bonds* (DPI undated).

### 2.2 Financial instruments

In this report, financial instruments are defined as the means by which the agreed amount of financial assurance is guaranteed to be available to the regulator in the event of operator insolvency. Financial instruments are a key component of financial assurance systems (see Section 2.3).

The ultimate purpose of financial assurance for site rehabilitation is to provide a high degree of certainty that adequate funding will be accessible to the State to undertake rehabilitation works in the event of rehabilitation default by the operator.

Although a range of factors may contribute to the inability of an operator to carry out rehabilitation works, financial assurance mechanisms have the intent of mitigating financial factors. These include:

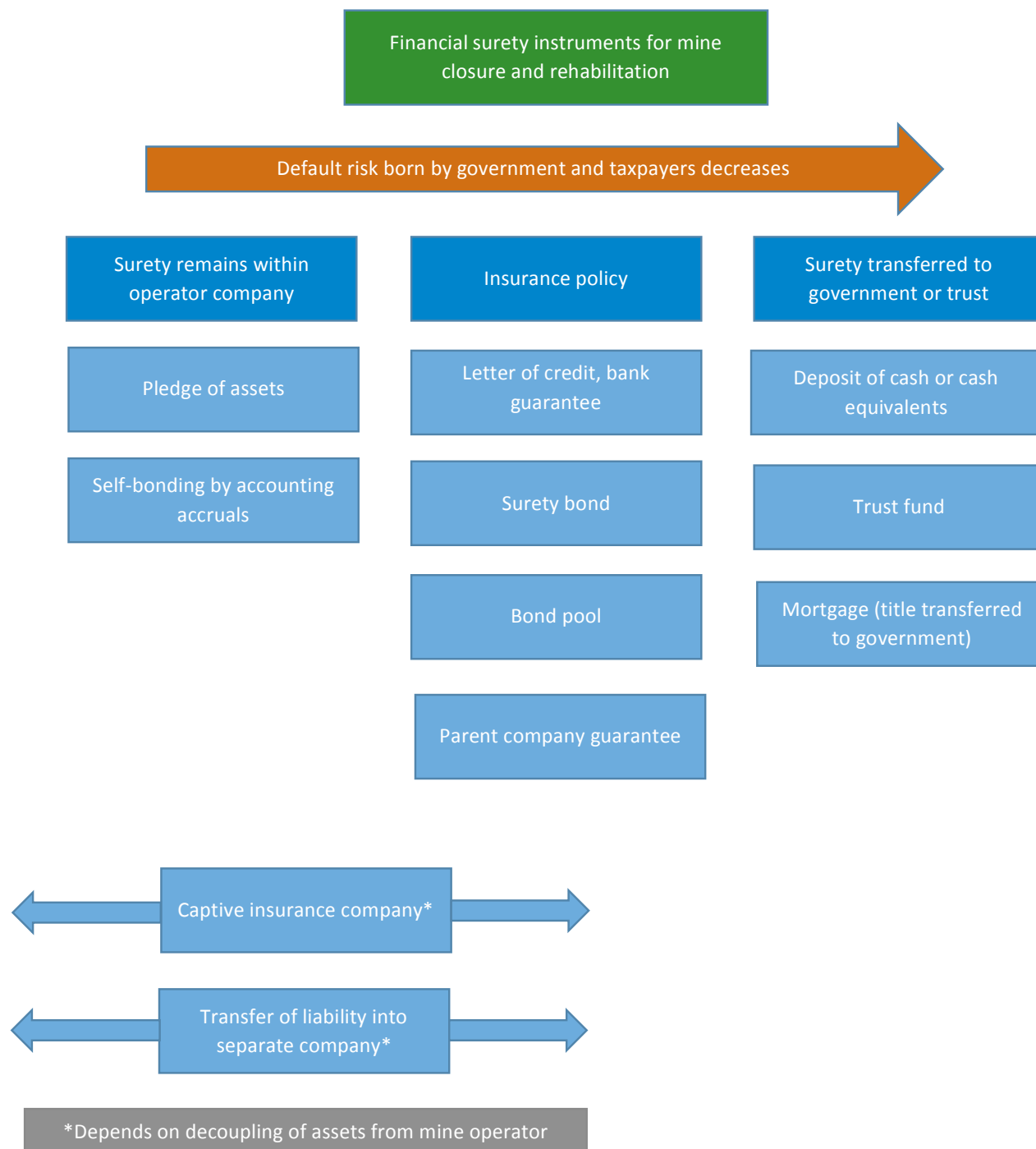
- the operator being placed in administration
- the operator being unable to fund rehabilitation works due to poor cashflow, even though the firm may have considerable assets
- the operator changing ownership structure in a way that reduces or extinguishes rehabilitation liabilities
- the operator lacking capability and/or capacity to undertake required rehabilitation works at the time required due to a change in staffing mix.

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<sup>1</sup> In DPI (undated), the wording of the second guiding principle regarding moral hazard was changed to ‘The system should avoid creating moral hazard’.

Over time, regulators of mining activities around the globe have permitted a range of alternative financial instruments to be used as the basis for providing financial assurance. These are summarised in Figure 4 (MonTec 2007).

**Figure 4 Categories of financial guarantee instruments (Sourced from MonTec 2007, p. 22.)**



As illustrated in Figure 2, the financial instruments can be classified according to the extent to which the probability of the government not having clear access to adequate funds is reduced.

The highest guarantee is provided by financial instruments that are held by government, or held in trust by government. This means that the government has direct control over the funds and is able to monitor directly the liquidity and adequacy of the instrument.

At the other end of the spectrum, the lowest guarantee is provided by instruments that are held by the mine operator, either in the form of cash or provisions held on a balance sheet. Although such instruments relatively low cost for operators, the risk to government is substantial because access to the instrument is indirect. Of particular concern is a scenario where the operator is placed in administration. In that circumstance the government would become an unsecured creditor, facing the real prospect of funding under the financial instrument not being available once obligations to more senior creditors are discharged. Even where the financial instrument is held by a financially sound operator, the ability of the government to monitor the adequacy of funding is constrained.

Financial instruments issued by a third party institution, fall between the two alternate ends of the spectrum. This class of instrument is typically an asset held against a financial institution such as a bank or insurance company, and provides a 'guarantee' of payment, contingent upon the inability of the operator to meet its funding obligation. The degree of risk to the government under each instrument varies.

In the following section greater detail is provided on each of the financial instruments outlined in Figure 4.

## 2.2.1 Surety held by operator

### **Pledge of assets**

A pledge of assets is essentially a promise to transfer the ownership of all assets that remain on the site following site closure to the government or regulator. Determining the true financial value of this instrument is difficult because it relies on ascertaining that the assets have no existing charge over them, that there is a market for the assets, the value of those assets in that market and the transactions costs that would be incurred to effect the sale.

As a result, a pledge of assets is very rarely accepted as financial instrument.

### **Self-bonding by accounting accruals**

Under this approach, the operator provides an assurance that sufficient funds have been set aside to meet closure and rehabilitation costs. Typically, provision is made as a liability on the balance sheet. In some examples, the opinion of an independent auditor is required to determine the adequacy of the provision and the corresponding assets.

The key risk under this instrument is from the operator, or the controlling entity of the operator, entering into administration or insolvency. Under this scenario, the government or regulator would likely to be listed as an unsecured creditor. Whilst it may be possible that following completion of the process the government would receive the provisioned funds, the degree of risk that this would not occur is relatively high.

### **Controlled bank account**

A controlled bank account is an account held at a financial institution in the name of the operator. However, restrictions are placed on the draw-down of funds from the account. The regulator or government is typically named as a party to the account, and usually is the authorising party for release of funds.

A defining feature of a controlled bank account is that funds are released as reimbursement to the operator for works done to rehabilitate the mine in accordance with the requirements of the licence.

Transaction costs are minimal under this option, how there is an opportunity cost incurred by the operator from holding funds in the controlled account, where the interest earned is relatively lower than alternative investment.

## 2.2.2 Surety guaranteed by third party

### Insurance policy

There is an emerging market in insurance products that are offered to provide cover against the *consequential* risks of not undertaking adequate mine rehabilitation works, and in some international markets, insurance products are offered that guarantee that mine rehabilitation obligations are met in the event of default by an operator. However, a commercial insurance product of this type appears not to be widely available in the Australian market.

Insurance is more typically held to guard against sudden and accidental events, and gradual, slow to develop pollution events.

### Bank guarantee

A bank guarantee is an agreement between the operator and the bank that funds will be provided to the government (or addressee) for rehabilitation purposes if needed. The government must decide from which banks they will accept a guarantee. The guarantee is administratively simple for the government. For the operator however it can limit their access to capital, as it is considered to be the provision of credit by the financial institution.

A bank guarantee has the following characteristics:

- it is an unconditional, written undertaking issued by a financial institution (usually a bank) in favour of a third party (in this case it would be the government or regulator)
- the 'guarantee' is for the financial institution to pay a defined amount of the bank customer's money upon demand by the named third party.

The high degree of security offered by the bank guarantee, as a result of the unconditional nature of the instrument, makes bank guarantees the most common form of financial assurance instrument for mine rehabilitation liability.

Bank guarantees can be relatively costly for operators. The issuing institution typically charges a fee or premium each year, and will require the operator to provide security as backing for some portion of the guarantee. It should be noted though that some large operators with strong balance sheets have obtained bank guarantees without a requirement to pay a premium or fee.

From the perspective of financial institutions, a bank guarantee can be viewed as the equivalent of a loan. Operators frequently comment that this means the borrowing capacity of the operator is restricted by the use bank guarantees.

### Letter of credit

A letter of credit is similar to a bank guarantee, however it typically has a number of conditions attached to payment of credit to the nominated party. Of particular relevance to rehabilitations assurance, the regulator would typically be required to prove that the operator had failed to meet its obligations prior to release of funds under the letter of credit.

The EPA notes that a letter of credit is established in a similar manner to a bank guarantee (EPA 2015b). However, in order to claim against the letter of credit, the regulator or government must present the bank with documentation showing a default on behalf of the operator.

The key disadvantage of a letter of credit is in the need for the regulator to demonstrate the operators' default to the bank.

### Surety bond

A surety bond is a financial instrument typically issued by an insurance company. The operator would take out an insurance bond with an insurance company. The government or regulator is named in the terms of



the bond as the beneficiary of the funds to be provided by the bond, following a defined event or events. In this case the defined event would be default by the operator in undertaking rehabilitation works agreed under the license conditions.

Surety bonds are typically taken out for a specific period of time (e.g. one year). They require the payment of a premium by the operator, and would be renewed at the end of the contract period. This provides an opportunity for the coverage under the bond to be amended. It also permits the insurer to reassess the risks under the contract and adjust the premium accordingly.

### **Bond pool**

A bond pool is typically made up of contributions made by a range of operators in a particular location and is managed by the industry. The bond pool is designed to provide a fund that can be drawn against to meet the mine rehabilitation obligations of operators in the case of bankruptcy or other unforeseen events.

Bond pools have a number of undesirable attributes. First, it is difficult for the government or regulator to observe the adequacy of funds and the form of funds held in the bond pool. The pool of risk also creates an incentive for individual operators to not incur progressive mine rehabilitation expenses because the contributions made by the remaining pool contributors can be relied upon to discharge rehabilitation obligations.

### **Parent company guarantee**

A parent company guarantee would be relevant where the local operator is a subsidiary of a larger firm. The parent company would typically consolidate the assets and liabilities of the local subsidiary on its balance sheet. Where the parent company is a large, financially stable multi-national company, this form of guarantee could be relatively low risk for the government or regulator. However, the inability to monitor the activities and true financial position of a multi-national firm would weigh against this option.

## **2.2.3 Surety transferred to government or trust**

### **Deposit of cash or cash equivalents**

Deposits of cash or cash equivalents are the most desirable and least risk form of financial assurance instrument from the perspective of the regulator. In this case a cash payment is made into a government-owned bank account that would be sufficient to cover expected rehabilitation costs. The key advantages are that the funds are highly liquid, directly accessible by the government and free of credit risk.

From the perspective of operators, cash or cash equivalent deposits are highly inefficient, due to the opportunity cost of the funds held in deposit with the government.

### **Trust fund**

An operator can establish a trust fund with an agreement that the money is to be used for rehabilitation only. Contributions to the fund can be made according to a payment schedule or as a lump sum.

The EPA (2015b) notes the following regarding trust funds:

- they are typically created by a single duty holder (although can have joint signatories)
- the trustee is permitted to accumulate income from funds invested in the trust
- the accumulated income may be added to the capital.

An accumulating trust fund is established to hold cash or other assets on behalf of the operator.

The powers of the trustee and the rights of beneficiaries are set out in the trust agreement. The regulator or government would be a beneficiary of the trust. The trust can be designed to accumulate a balance over time, or to maintain a constant balance.

From the perspective of the operator, a trust fund would result in an opportunity cost being incurred because the funds or financial instruments held in trust cannot be put to alternative use.

Depending how the money in a trust fund is invested it can lose value. The fund must therefore be monitored to ensure that it holds the required level of funds. Trust funds must be set up so that if the company becomes insolvent, the money is available to the regulator and is not seized by other creditors (DPI undated).

### **Mortgage (title transferred to government)**

Under this option the operator would provide a mortgage over property owned by the operator for the benefit of the government or regulator. Once rehabilitation works have been undertaken to the satisfaction of a relevant authority, the mortgage would be discharged. The true value of this instrument would largely depend upon the existence of a market for the property over which the mortgage is held. For this reason, it would be desirable for the property to not be of a specialised nature. The potential for significant fluctuation in the value of the assets and the liquidity of the asset over time means that this form of financial assurance instrument is rarely used for mine rehabilitation assurance.

## 2.3 Financial assurance systems

In this report, financial assurance systems are defined as the systems by which governments manage risks associated with rehabilitation liability, including determining the required amounts of financial assurance, regulating the provision of financial assurance and encouraging progressive rehabilitation.

There are a range of financial assurance systems in operation in Australia and internationally. However, most share the following characteristics:

- They assume that rehabilitation will be undertaken by a third party, not the mine operator, and calculate the financial assurance amount accordingly.
- The financial assurance amount is subject to periodic review and can be adjusted according to increases or decreases in estimated rehabilitation liability.
- The potential for operators to reduce their financial assurance amount by reducing rehabilitation liability provides incentive for progressive rehabilitation.
- With the exception of pooled or sinking funds, each financial assurance amount is tied to a specific mining licence or operation.

The most common financial assurance systems for mining operations are briefly described below.

### 2.3.1 Full financial assurance systems

Full financial assurance systems require that 100% of the rehabilitation liability of a mining operation is covered by financial assurance across the life of the project. The financial instrument used to underpin the system is typically an unconditional bank guarantee. Such systems are a common means of managing financial assurance for mining operations, both in Australia and internationally. The Victorian rehabilitation bond system is one such example.

Full financial assurance systems provide the government with a high degree of protection against rehabilitation default by the operator, provided the rehabilitation liability has been accurately estimated and the financial instrument used is low risk (such as an unconditional bank guarantee).

Such systems seek to provide incentive for progressive rehabilitation by offering the potential to reduce the financial assurance amount. The incentive for progressive rehabilitation is strongest for operators that place a high value on the opportunity cost (or cost of capital) of the security for a bank guarantee.

The disadvantages of financial assurance systems include limiting an operator's access to capital since the provision of a bank guarantee is considered to be a provision of credit by the financial institution (DPI

undated). Also, in requiring 100% rehabilitation liability coverage for each site, the system does not reflect the historically low rehabilitation default rate of mining operations in most jurisdictions.

### 2.3.2 Discount financial assurance systems

Discount financial assurance systems offer eligible operators a performance-based discount in the amount of financial assurance that they are required to provide. The criteria for entering a discount system typically includes financial viability, good regulatory behavior (such as timely payment of fees, lack of infringement notices) and a demonstrated commitment to progressive rehabilitation. As with a full financial assurance system, the financial instrument used to provide the assurance is typically an unconditional bank guarantee.

Discount systems seek to reward those members of the industry who have demonstrated past good behavior, thereby providing an incentive to others. The inclusion of rehabilitation performance in the entry criteria is a way of encouraging progressive rehabilitation.

Such systems may have a range of discounts available depending on the categories and levels of operator performance, or to have a set discount that applies to all eligible operations. Discount systems may require all operators to step up to full financial coverage prior to site closure.

Discount systems can work in parallel with full financial assurance systems. Sites that are not eligible for the discount, or have been required to exit the discount system due to poor performance, operate under the full financial coverage system.

A degree of moral hazard exists with discount systems as the amount of financial assurance is less than the rehabilitation liability. The greater the discount, the greater the moral hazard.

### 2.3.3 Pre-defined liability proportion systems

In pre-defined liability proportion systems, the proportion of rehabilitation liability covered by financial assurance increases in a number of pre-defined increments across the life of a mining operation, reaching 100% coverage prior to closure.

As with a discount bond system, performance criteria can be specified that operators have to meet to enter and remain on the system. In such a case, the pre-defined liability proportion system would operate in parallel with a full financial assurance system.

Alternatively, the pre-defined liability proportion system can be applied to all operators regardless of performance. The system is simpler in this case as operators do not switch back and forth between the proportion system and a full financial assurance system. This simpler system is attractive to operators as, in addition to the discount they receive, they have certainty regarding the timing and percentage of the incremental increases in their financial assurance.

The pre-defined liability proportion system provided allows greater access to capital, particularly during the earlier stages of operational life. As with all systems involving a discount in financial assurance, a degree of moral hazard exists.

### 2.3.4 Pooled fund systems

In pooled fund (or sinking fund) systems, some or all of the financial assurance within a jurisdiction is held via a managed fund that enables the risks of rehabilitation default to be partially shared across the mining sector. There are two potential types of pooled fund systems – government-owned and industry-owned (DPI undated). Both pooled fund systems share the following characteristics:

- Each operation pays into the fund an annual amount that is proportional to its estimated rehabilitation liability.

- The total amount of financial assurance held across the sector is less than the sum of all rehabilitation liabilities. Individual participating operations provide a lower financial assurance amount than the rehabilitation liability of their site.
- Funds are not tied to a specific mining licence or operation. The government can therefore allocate funds to other rehabilitation needs, such as supplementing rehabilitation funds for a site that has defaulted and been found to have had inadequate financial assurance, or the rehabilitation of legacy abandoned mines.
- There is an inherent issue of cross-subsidy, whereby money from well-performing operations is used to fund the rehabilitation of defaulting operators.
- Moral hazard exists if contributions to the fund are small compared to the size of an operator's liability, which is typically the case in pooled funds.
- Clear policies and governance must be established regarding the prudential oversight of the fund's investment, the necessary baseline balance, the rate of contributions, and for what purposes the funds may be used (DPI, undated).

### 2.3.5 Insurance based systems

Under an insurance based system, operators could be required to hold an insurance policy to cover the risk of rehabilitation default (DPI undated). The system would be similar to the full liability coverage system except that insurance would be the financial instrument instead of an unconditional bank guarantee. Rehabilitation liability would be estimated when the insurance is taken out and reviewed periodically. The insurance would be sufficient to cover the full cost of third party site rehabilitation. Significant penalties would apply in the case that an operator was found to be under-insured or had not paid a premium.

## 3 Cross-jurisdictional review

A desktop-based cross-jurisdictional review was undertaken of existing financial mechanisms for rehabilitation in Australia and internationally.

### 3.1 Victoria

#### 3.1.1 Rehabilitation bond system for mining and extractive industries

##### Existing rehabilitation bond system

In Victoria, the *Mineral Resources (Sustainable Development) Act 1990* (MRSD Act) requires the holder of an exploration / mining licence or extractive industry work authority to rehabilitate the land in accordance with the rehabilitation requirements of the approved work plan, licence conditions or specific code of practice (DEDJTR 2015). In such cases a rehabilitation bond is required for an amount determined by the Minister. In Victoria, 'rehabilitation bond' is the term used for financial assurance.

The DEDJTR guideline *Establishment and Management of Rehabilitation Bonds for the Mining and Extractive Industries* (DEDJTR 2015) sets out the department's policies for the establishment and management of rehabilitation bonds and outlines the methods to be used in assessing rehabilitation liability. Key features as set out in the guidelines and applicable to the Latrobe Valley coal mines are summarised below:

- The Earth Resources Regulation Branch (ERR) of DEDJTR is responsible for setting and reviewing rehabilitation bonds as required by the MRSD Act.
- Rehabilitation plans must take into account a number of factors listed in section 79 of the MRSD Act, including the need to stabilise the land, and any potential long term degradation of the environment.
- The MRSD Act requires rehabilitation to be carried out progressively during the life of the operation. Mining licences are also granted subject to a number of conditions that may contain further rehabilitation requirements.
- Section 80 of the MRSD Act requires a licensee to enter into a rehabilitation bond for an amount determined by the Minister. The condition of a rehabilitation bond is that the authority holder rehabilitates the land as required by section 78 or 78A of the MRSD Act.
- Rehabilitation bonds are periodically reviewed by DEDJTR to ensure that they remain at appropriate levels during the life of the operation. The bond is also reviewed when a work plan variation is submitted, a tenement is transferred or when requested by the tenement holder.
- The amount of bond is calculated to address in full the rehabilitation liability based on the works specified in the approved work plan.
- For periodic bond reviews, the bond is calculated on the existing rehabilitation liability at the time of the review. Rehabilitation liability is calculated on achieving the final rehabilitated landform as specified in the rehabilitation plan.
- Currently, DEDJTR only accepts rehabilitation bonds in the form of an unconditional bank guarantee.
- A rehabilitation bond calculator has been developed by the department. Operators are able to undertake self-assessment of their rehabilitation liability by the use of the rehabilitation bond calculator. A licensee can choose to use an alternative calculation methodology but will need to provide sufficient documentation to substantiate how the liability estimate was derived.
- In establishing the rehabilitation liability it must be assumed that the operator is unable to complete the reclamation works and therefore rehabilitation must be managed by the department using a 'third

party.<sup>1</sup> Accordingly, the level of the rehabilitation bond will typically be significantly higher than the cost for the operator to undertake the work.

- An estimate of the rehabilitation liability is also required in annual reports by mining licensees under the *Mineral Resources Development Regulations 2002*.

### Rehabilitation bond policy reform package

A rehabilitation bond policy reform package was prepared by DEDJTR in 2014 (Victorian Government 2015). The reform package recommends the introduction of:

- a two-track bond model, involving:
  - 25 per cent bond discount for operations that meet the eligibility criteria throughout production
  - once operation ceases production, full bond (100 per cent) must be provided
  - if operations on the scheme fail to meet any eligibility criteria at any time, they will be required to provide full bond (100 per cent)
  - start-up bond scheme (for new operations) – 50 per cent bond discount for new operations over first five years that meet the eligibility criteria. After year five of operation, full bond must be provided
- cash bonds - allowing cash payment (instead of bank guarantee) for bonds up to \$20,000.

Implementation of the rehabilitation bond reform package is underway by DEDJTR. The rehabilitation bond policy reform package expressly excludes high-risk sites, including coal mines (Victorian Government 2015).

### Post-closure trust fund

The Minister for Planning's Assessment under the Environment Effects Act 1978 of the proposed Stockman Project in East Gippsland will require the company and the government to co-contribute to a Post-closure Trust Fund (PCTF) (Victorian Government 2014). The requirement for a PCTF recognises the future need for ongoing monitoring and maintenance of post-closure risks associated with the mine, in particular the tailing storage facility. An independent assessment of the net present value for these requirements was undertaken and estimated to total approximately \$5.5 million.

A legally binding agreement between the proponent and the State would require the proponent to contribute to the PCTF. The Assessment recommends that an initial amount be contributed to the PCTF prior to commencing works, with allowance in the agreement for review of the adequacy of this amount prior to hand back. The ability to review the fund amount and require additional contributions is consistent with similar mechanism available for rehabilitation bonds (see s. 80(4) MRSD Act).

### Key points

- The rehabilitation bond system applies to both mining and extractive industry sites.
- 100% financial assurance held by government.
- A rehabilitation bond calculator is available to estimate rehabilitation liability.
- Currently, rehabilitation bonds are only accepted in the form of an unconditional bank guarantee.
- Bond reforms will introduce discount bonds and small cash bonds (but coal mines excluded from reform package).
- Precedent has been set in Victoria for the establishment of post-closure trust funds.

### 3.1.2 Victorian Environment Protection Authority

Section 67B of the Victorian *Environment Protection Act 1970* (EPA Act) and associated regulations provide for the Environment Protection Authority (EPA) to require duty holders to provide financial assurance as a condition of a licences or works approvals for certain scheduled activities (EPA 2014).

EPA is currently reforming the financial assurance system and has issued a draft guidance on how to determine the amount of financial assurance for landfills, prescribed industrial waste (PIW) management, container washing and PIW composting (EPA 2015a).

Operational landfills are required to maintain both the operational, and the closure and aftercare components of financial assurance. Closed landfills are required to maintain the closure and aftercare component.

#### Landfill operational financial assurance

In the draft guidelines, EPA proposes a simple formula to calculate the required operational financial assurance for landfills (EPA 2015a). The formula is:

$$\text{Operational FA} = \$ (0.20 \times \text{filled volume in cubic metres}) + \$370,000$$

The formula was derived using estimated remediation costs for the following types of unplanned events at variably sized landfills:

- excessive seepage or loss of leachate containment
- illegal dumping
- slumping of batters
- failure or erosion of temporary capping or vegetation.

Landfills deemed by EPA to be outside the assumptions inherent in the formula should instead calculate the required landfill operational financial assurance in consultation with EPA.

The formula is based on 2015 costs and shall be indexed using the Consumer Price Index adjustment calculation below for financial assurance calculations performed in subsequent years.

#### Landfill closure and aftercare financial assurance

The draft guidelines (EPA 2015a) require that the calculation of closure and aftercare financial assurance addresses the costs of complying with the Landfill Best Practice Environmental Management Document (EPA 2015c) and the *Closed Landfill Guidelines* (EPA 2012). The financial assurance is required to include costs associated with final capping works, revegetation, infrastructure costs, technical assessments, environmental monitoring, preparation of rehabilitation plan and aftercare management plan, ongoing management and maintenance, inspection auditing and reporting.

The financial assurance for closure and aftercare can be reduced upon auditor verification that the closure activities are completed.

#### Financial instruments

As part of their reform of the financial assurance system, EPA has issued draft guidance on types of financial assurance that may be considered (EPA 2015b). These are:

- bank guarantees
- guarantees (by deed poll)
- mutual funds
- accumulating trust funds
- controlled bank accounts
- letters of credit

- certificates of title
- bonds
- insurance.

### Key points

- Guidance is in draft stage.
- Simple calculation (flat rate) of landfill operational financial assurance.
- Two components of financial assurance:
  - Operational
  - Closure and aftercare.
- Consumer Price Index adjustment for the financial assurance.
- Wide range of financial assurance types may be considered by EPA.

## 3.2 Northern Territory

In the Northern Territory, up until 2013, the default financial assurance system involved the calculation the rehabilitation liability for a given period with 100% financial assurance held in the form of an unconditional bank guarantee. In 2013 the *Mining Management Act* (MMA) was amended to require operators to pay an annual non-refundable levy in addition to lodging a security bond (NT Mines and Energy 2015).

Under the 2013 financial assurance system, mining projects now lodge 90% financial assurance held in the form of an unconditional bank guarantee or cash and pay an annual levy set at 1% of the financial assurance amount.

The levy provides funds for addressing the territory's legacy mining liabilities, estimated to be \$1 billion. The discount of 10% in the total security amount payable by operators is to offset the cost of the levy to industry (NT Mines and Energy 2015).

### Key points

- 90% financial assurance required from operators.
- Financial assurance required in the form of an unconditional bank guarantee or cash.
- Annual levy 1% of financial assurance amount to fund rehabilitation of legacy sites.

## 3.3 New South Wales

### 3.3.1 Financial assurance system and legacy mines

The New South Wales (NSW) financial assurance system provides financial assurance for existing mines as well as generating funds for addressing the issue of legacy mining projects. The system involves the calculation of the rehabilitation liability for a given period with 100% financial assurance held in the form of an unconditional bank guarantee or cash (NSW Industry and Investment 2010). Currently around \$1.8 billion is held in security deposits (NSW Resources & Energy 2015a).

A rehabilitation cost calculation tool is available to assist in calculating the security deposit for a site. Partial release of the security deposits may occur when successful rehabilitation has been demonstrated for part of the site (NSW Resources & Energy 2015a).



## Legacy mines

NSW has a Derelict Mines Program to rehabilitate legacy mining projects. There are currently an estimated 573 derelict mine sites in NSW. It is unclear how much further rehabilitation work needs to be done on these sites (Pepper et al 2014).

### Levy

In 2012, the NSW government introduced an administrative levy on the mining and petroleum industries to meet the costs of compliance and enforcement, and to improve assessment, approvals and communications capabilities (NSW Resources & Energy 2015b).

The administration is an annual charge equivalent to 1% of the rehabilitation security deposit and can only be used for the purpose of funding minerals and petroleum administrative costs and the Derelict Mine Sites Fund (NSW Resources & Energy 2015a).

### Key points

- 100% financial assurance is held by government.
- Financial assurance is required in the form of an unconditional bank guarantee or cash.
- A rehabilitation bond calculator is available to estimate rehabilitation liability.
- There is an annual levy of 1% of the financial assurance amount to fund administrative costs and the Derelict Mines Program.

## 3.3.2 Mine subsidence trust fund

The *Mine Subsidence Act 1961* provides for the Mine Subsidence Board to provide compensation or repair services where properties, such as houses, are damaged by coal mine subsidence. The Mine Subsidence Board is also responsible for reducing the risk of mine subsidence damage to properties by assessing and controlling the types of buildings and improvements which can be erected in Mine Subsidence Districts (NSW MSB 2015).

Other important roles of the Mine Subsidence Board include the elimination of public and private danger caused by mine subsidence, funding research programs that meet the existing and future needs of the community and industry, and the provision of a comprehensive and accessible advisory and technical service (NSW MSB 2015).

### Levy

Contributions are payable to the Mine Subsidence Compensation Fund (the Fund) by proprietors of colliery holdings. The contribution is, for each dollar of the land value of that colliery holding, to be calculated at the rate determined for that colliery holding (NSW Government 2012).

### Key points

- Annual levy of colliery holding, primarily to fund compensation of any damage caused by subsidence.
- Funds can be used to identify, complete and promote research programs that meet the existing and future needs of the community and industry.

## 3.3.3 Coal Seam Gas industry risk review

The NSW Government Chief Scientist & Engineer investigated the environmental risk, responsibility and insurance arrangements for the NSW coal seam gas (CSG) industry (NSW CS&E 2014).

The investigation found that there is a gap in policy which does not address long term or unforeseen environmental impacts and that company liability cover and insurance is a difficult space to regulate. In

addition, there is no mechanism to address unforeseen and/or long term environmental impacts potentially attributed to these gas extraction activities

The investigation notes that there are three primary levels of risk which need to be addressed in this regard:

- Expected costs – covered by a security deposit (provided by industry to Government) such as upfront cash or a bank guarantee
- Sudden accidental pollution – covered by insurance (provided by industry)
- Unforeseen and long term costs – covered by environmental fund (provided by industry to Government) to address government costs associated with unforeseen and long term impacts including in the event of well abandonment or company insolvency.

### Key points

- Separate financial instruments for separate risks components:
  - expected costs covered by security deposit
  - sudden accidental pollution covered by insurance
  - unforeseen and long term costs covered by an environmental fund.

## 3.4 Queensland

### 3.4.1 Financial assurance system

The financial assurance system in Queensland involves the calculation of rehabilitation liability for a given period with 100% financial assurance held in the form of an unconditional bank guarantee or cash in limited circumstances (DEHP 2014a). In March 2014, the Department of Environment and Heritage Protection (DEHP) introduced a new discount system.

The government provides a calculator, similar to the NSW and Victorian calculation tools, to help with estimating financial assurance (K. Brown, *pers comm*).

#### Discount system

The discount system, whereby operators reduce the amount of financial assurance payable, is applied to reward licensees who have a low risk of default, low incidence of non-compliance, and low risk of environmental harm (DEHP 2014a).

The key aspect of this scheme is that a discount of up to 30% is offered based on meeting financial, compliance and rehabilitation criteria. Since its inception, 45 out of the 229 sites with financial assurance (20%) have applied and been accepted into the discount scheme (K. Brown, *pers comm*).

Sites that do not qualify, or have not applied, for the discount system remain on the 100% financial assurance system.

#### Pooled fund investigation

During 2014, the Queensland Government investigated the development of a pooled fund model similar to the Western Australian MRF and developed a discussion paper. However, the pooled fund model received insufficient support and further development work has been discontinued (K. Brown, *pers comm*).

#### Post closure fund

Operators may be required to make a residual risk payment after lodging an application to request certification of progressive rehabilitation or application to surrender an authority for the resource, this

payment covers the Queensland Government's potential rehabilitation costs incurred by the operators resource activity after financial assurance has been returned. The administering authority will decide on the size of the residual risk payment by calculating all potential costs of rehabilitating, restoring and protecting the environment after your resource activity is complete (DEHP 2015).

### Key points

- Base case 100% financial assurance held by government.
- Performance-based discount of up to 30% of the financial assurance is available based on meeting financial, compliance and rehabilitation criteria.
- Financial assurance is required in the form of an unconditional bank guarantee.
- A financial assurance cost calculation tool is available.
- A residual risk payment may be required.

### 3.4.2 Audit of financial assurance

In 2013, the Queensland Audit Office prepared a report on the environmental regulation of the resources and waste industries (QAO 2013).

#### Financial assurance risk

The Audit Office found that, in June 2013, the state held mining environmental authorities with financial assurance totaling \$4.45 billion, up from \$1.6 billion in 2008. Although recent initiatives by the Department of Environment and Heritage Protection (DEHP) had increased the financial assurance held by the state, the investigation found that:

- The financial assurance held is often insufficient to cover the estimated costs of rehabilitation.
- Where financial assurance is insufficient to cover the costs of rehabilitation the responsible departments are reluctant to take action.
- There is little evidence of progressive rehabilitation occurring in Queensland.
- As a result, successful environmental rehabilitation is not occurring and the state remains exposed to unnecessary and unacceptable financial risks.

#### Audit Office Findings

The Audit Office found that, to be effective, financial assurance should be material enough to promote compliance with environmental compliance conditions and sufficient to cover the costs of rehabilitation, thus limiting the exposure of the state.

The inability of environmental authority holders to meet environmental requirements means some sites become non-operational and go into 'care and maintenance' as a means of avoiding rehabilitation.

Where the financial assurance of a failed operation is insufficient, the government is left with three options:

- not rehabilitating the site at all
- rehabilitating the site only to the extent covered by the amount of financial assurance held
- completely rehabilitating the site at taxpayer's expense.

### Key points

- To be effective, a financial assurance should be material enough to promote compliance with environmental compliance conditions and sufficient to cover the costs of rehabilitation.
- Departments are reluctant to take action where financial assurance held is insufficient.

- There is little evidence of progressive rehabilitation occurring in Queensland.
- Care and maintenance may be used as a means of avoiding rehabilitation.

### 3.5 South Australia

The financial assurance system in South Australia involves the calculation the rehabilitation liability for a given period with 100% financial assurance held in the form of an unconditional bank guarantee (DSD 2015).

#### Post closure trust fund

In South Australia, the regulators have recognised that potential post closure liabilities need to be addressed and that a review of the current arrangements will need to be carried out. The Saskatchewan Institutional Control Program (see Section 3.10) is a model that would be included in any benchmarking study (G. Marshall *pers comm*).

#### Cost calculation

Mining operators have been referred by government to either the NSW or Victorian rehabilitation cost calculators to estimate rehabilitation liability (T. Ward, *pers comm*). However, South Australia is trialing its own rehabilitation liability estimation tool to more accurately determine the rehabilitation liabilities. The South Australian calculation tool includes additional features such as a cost loading based on the remoteness of operations.

#### Key points

- 100% financial assurance is held by government.
- Financial assurance is required in the form of an unconditional bank guarantee.
- A financial assurance cost calculation tool is available.

### 3.6 Tasmania

The financial assurance system in Tasmania involves the calculation the rehabilitation liability for a given period with 100% financial assurance held in the form of an unconditional bank guarantee or cash (MRT 2013).

#### Legacies

Many of the larger mine sites in Tasmania include areas of historical disturbance. Acid mine drainage is a legacy from some historical workings. The security deposits on most of the larger operations are insufficient to cover the cost of the current on-site liabilities, in the form of both current disturbance and historical legacies (MRT 2013).

#### Transitional financial assurance

Mineral Resources Tasmania (MRT) considers that the rehabilitation liabilities at some sites may amount to \$20-30 million, while the security deposits held are only for \$2-3 million. MRT does not consider it possible for a company to increase the financial assurance ten-fold over a short period of time.

Transitional Provisions provide guidance on the process and timetable for matching the security deposit to the rehabilitation and decommissioning liability (MRT 2013).

## Post closure fund

One security deposit specifically exists for the long-term maintenance of a dam. Mining companies have been advised that where a tailings dam is to be abandoned a portion of the security deposit will be retained to provide funds for dam surveillance and routine maintenance (e.g. where acid generation will be managed by a permanent water cover) (MRT 2013).

### Key points

- A portion of a security deposit will be retained for the maintenance of tailings dams.
- There is transitional financial assurance for sites with historical legacies.

## 3.7 Western Australia

Up until 2013, the financial assurance system in Western Australia involved the calculation the rehabilitation liability for a given period with 100% financial assurance held in the form of an unconditional bank guarantee. The Department of Mines and Petroleum (DMP) in Western Australia introduced a new bond scheme in 2013, the Mining Rehabilitation Fund (MRF).

### Mining Rehabilitation Fund

By 1999, the increasing costs and standards of rehabilitation reduced the value of financial assurance held by government to approximately 80 per cent of the total cost of rehabilitation industry-wide. By 2005 the value held had dropped to approximately 25 per cent. The government decided to move towards full liability securities; however the global financial crisis hit and alternative options to enhance mining securities were investigated resulting in the introduction of the MRF (Leybourne 2014).

The key aspect of the MRF is an annual levy to be paid by tenement holders into a pooled mining rehabilitation fund, providing the Government with the funds to cover rehabilitation costs when tenement holders are unable to do so (DMP 2014).

The MRF calculates the levy based on existing environmental disturbances at the tenement at the annual reporting date. The total rehabilitation liability estimate is multiplied by 1% to determine the amount owed for each tenement.

The incentive for tenement holders was the opportunity to have the bank guarantees held against their tenements retired; although for high risk mines the 100% security will continue to be retained. The levy does not absolve tenement holders of the requirement to properly rehabilitate their sites; however, it will provide government with funds to cover costs when required (DMP 2014).

In addition, interest generated from the MRF will be used to rehabilitate Western Australia's legacy abandoned mine sites. The Western Australian abandoned mine database lists some 10,000 abandoned mine features, and an abandoned mine policy currently being drafted will provide a framework for these features to be considered and prioritised for rehabilitation.

### Ellendale Diamond Mine

The Ellendale diamond mine in Western Australia, went into administration in 2015, after \$12.1 million worth of security was retired in mid-2013 after signing up to the MRF (The West Australian 2015a). An unexpected wall slip in the main pit in mid-2013 forced a suspension of mining (The West Australian 2015b). The liquidators have been unable to find a buyer for Ellendale with the major barrier being the estimated "\$28 million environmental rehabilitation cost" at the Kimberley mine. The problem was exacerbated by the company's "failure to set aside rehabilitation money" (The West Australian 2015a).

The liquidators are seeking to return the leases to the DMP. The responsibility for maintaining Ellendale's environmental obligations, as well as rehabilitation liabilities estimated at \$28 million by the company and up to \$40 million by DMP, onto the MRF (The West Australian 2015c).

### Key points

- An annual levy of 1% of financial assurance contributed to a pooled government owned fund.
- The fund can be used by government for rehabilitation on any tenement across the state, including abandoned sites.
- High risk sites still provide 100% financial assurance as a bank guarantee.

## 3.8 European Union

### Mining Waste Directive

European Commission Directive 2006/21/EC, on the management of waste from extractive industries (the Mining Waste Directive), was adopted by the European Community in March 2006 (EC 2006). Wastes covered by the Directive include tailings, waste rock, overburden and topsoil.

Operators of waste facilities are required to lodge a financial guarantee or equivalent sufficient to cover the cost of rehabilitation of the land in accordance with member state procedures. The guarantee should be in the form of a financial deposit, including industry-sponsored mutual guarantee funds. The size of the guarantee shall be periodically adjusted in accordance with any rehabilitation work needed to be carried out.

In 2009, the EC adopted technical guidelines for the establishment of financial guarantees in accordance with Article 22 of the Mining Waste Directive (EC 2009). Financial guarantees are required to consider impacts on the environment and human health. Costs to be assessed include those necessary to ensure land rehabilitation, closure and after closure, including possible after closure monitoring or treatment of contaminants.

### Key points

- Financial guarantees are required for facilities containing mine waste.
- 100% financial assurance is held by member state governments.
- Financial guarantees can be in the form of industry-sponsored mutual guarantee funds.
- Financial guarantees will need to consider factors including:
  - human health impacts
  - post closure monitoring or treatment of contaminants.

## 3.9 Manitoba

### Financial assurance system

The financial assurance system in the Province of Manitoba, Canada, enables proponents with corporate credit ratings that meet or exceed certain standards to avoid the payment of financial assurance entirely or to avoid it for the first half of the project life (Manitoba Industry Trade and Mines 2001).

For proponents that do not meet the credit rating criteria, the Manitoban system is based on a 'pre-defined liability proportion system' where projects make annual contributions towards their financial assurance until the full amount is reached.

The full financial assurance amount is based on the estimated full cost of rehabilitation, including any requirements for perpetual care.

The annual contributions are pre-defined proportions of the financial assurance amount. The proportions are related to the life of the project and contributions increase as the project proceeds (C. Liske *pers comm*).

For example, a project with a five year mine life pays its first installment of financial assurance (6.3%) in year 1 and reaches the full amount of financial assurance in year 4. In contrast, a project with a mine life of 15+ years pays its first installment of financial assurance (1%) in year 1 and reaches the full amount of financial assurance in year 14.

The maximum period of discount is 14 years and all operations must have the full 100% liability held at least one year from project end.

### Key points

- No financial assurance required for proponents with strong corporate credit ratings.
  - Large discount in financial assurance in early years of operation.
  - Progressive increase in financial assurance payments based on a pre-defined liability proportion system.
  - 100% financial assurance held prior to closure.
- Financial assurance includes requirements for perpetual care.

## 3.10 Saskatchewan

The Province of Saskatchewan, Canada, is more advanced than most jurisdictions when it comes to consideration of post-closure liabilities and providing guidance for post-closure cost estimation. This includes:

- Establishing a process under its *Reclaimed Industrial Sites Act 2006*, and related regulations and policies for long-term care and monitoring of decommissioned mine sites (NOAMI 2010).
- Providing a method for determining a discount interest rate for use in net present value calculations aimed at estimating liability for long-term/perpetual post-closure management (Saskatchewan Ministry of Energy and Resources 2009).
- Requiring scaled contingency funding for unforeseen post-closure events (such as a storm surge on a tailings storage facility) to cover maintenance and monitoring. A rate of 10% is applied to projects with no tailings or engineered structures and 20% for projects with tailings or engineered structures (NOAMI 2010).

### Institutional Control Program

In 2007, the province legislated to establish and enforce an Institutional Control Program. The program implements the process for the long-term monitoring and maintenance of mine sites when mining/milling activities have ended, remediation has been completed and approved, and the sites are ready to be transferred to provincial responsibility (Saskatchewan Ministry of Energy and Resources 2012).

The objectives of the Institutional Control Program are to:

- set out the conditions by which the Government of Saskatchewan will accept responsibility for land that, in consequence of development and use, requires long term monitoring and, in certain circumstances, maintenance
- ensure that the required monitoring and maintenance are carried out on that land
- provide a funding mechanism to cover costs associated with the monitoring and maintenance on that land

- ensure that certain records and information are preserved with respect to that land.

### **Post-closure fund**

To address the province's risk of accepting sites into custodial responsibility and the costs of future monitoring, maintenance and unforeseen future events, the holder responsible for an individual site establishes dedicated site-specific funding. The funds are managed by the province but are legislated and independent from provincial revenue (Ministry of Energy and Resources 2012).

### **Monitoring and Maintenance Fund**

An owner applying for entry of a closed site into the Institutional Control Program is required to pay the fund an amount representing the present value of the future costs associated with the monitoring and maintenance of the site.

### **Unforeseen Events Fund**

An owner applying for entry of a closed site into the Institutional Control Program is required to pay the fund an amount representing 10% of the present value of the future costs associated with the monitoring and maintenance of the site (20% for a closed site with tailings or engineered structures).

### **Key points**

- Government accepts responsibility for land that requires long-term monitoring and maintenance.
- Owner supplies funding to enter the program to cover the future costs associated with the:
  - monitoring and maintenance of the site
  - unforeseen events.

## **3.11 Nevada**

The State of Nevada, USA, is a major center of gold mining. The majority of mining projects in Nevada are governed by a combination of Federal and State Law, as 85% of land in Nevada is federally controlled (Sassoon, 2008). Nevada has signed a memorandum of understanding with Federal agencies to coordinate the administrative and enforcement obligations pertaining to the rehabilitation of mining land.

The amount of financial assurance required must be based on an estimate of the cost of executing the plan for reclamation which would be incurred by the state or federal agency having jurisdiction over the land, and must be sufficient to cover the cost of all aspects of physical closure and include administrative and contingency costs (State of Nevada 2015).

The type of financial assurance accepted by Nevada State Law is specified in Regulation NAC 519A (State of Nevada 2015). They include the following:

- (a) A trust fund
- (b) A bond
- (c) An irrevocable letter of credit
- (d) Insurance
- (e) A corporate guarantee
- (f) Any combination thereof.

Not more than 75% of the required financial assurance may be satisfied by the corporate guarantee, which is subject to periodic review and approval by the Administrator of the Division. The remaining portion of the financial assurance must be satisfied by a surety identified in this section (State of Nevada 2015).



Following successful closure the funds are returned to the proponent unless there is a long term outstanding obligation such as perpetual water treatment. In this case a special arrangement may be made such as a self-perpetuating fund (Sassoon 2008).

In addition, the Nevada Bureau administers a Bond Pool that guarantees companies with reclamation costs up to US\$3 million (State of Nevada 2015).

Incremental payments for the financial assurance are accepted as long as the amount of the fund at any given time covers the outstanding reclamation obligation. These payments are usually only applicable to larger projects and payment would be made at each subsequent phase of operations (Sassoon 2008).

### Key points

- A range of types of financial assurance are accepted.
- Up to 75 percent of the required financial assurance may be satisfied by the corporate guarantee.
- Financial assurance can include funding requirements for perpetual care.
- Incremental payments for the financial assurance are accepted.

## 3.12 New Zealand

### Financial assurance system

The financial assurance system for mining projects in New Zealand is regulated at the provincial government level. Typically, 100% financial assurance is required and held in the form of an unconditional bank guarantee.

Section 108 of the *Resource Management Act 1991* allows for a bond to be required as a resource consent condition, but provides little additional instruction. Accordingly, the development of the bond system for mining projects in New Zealand has been driven primarily by the industry in consultation with provincial and district councils (A. Paul *pers comm*).

Rehabilitation liability is estimated by an independent expert or by the mining company's experts (and generally then peer-reviewed by experts employed or engaged by the councils) on a site-specific basis. No standard cost calculator is used. Quantitative risk assessments have been broadly adopted in New Zealand as an important component of rehabilitation liability assessments. The quantitative risk assessment is typically undertaken jointly between the mine operators and the provincial council. Residual risks identified in the risk assessment (such as pit wall failure) are covered by insurance (*ibid*).

Progressive rehabilitation is driven by council enforcement and good industry practice rather than in response to financial assurance (*ibid*).

### Probabilistic cost assessment

The New Zealand bond system incorporates probabilistic cost assessment in setting financial assurance amounts. Probabilistic assessments consider the cost uncertainties associated with different components of rehabilitation (i.e. the risk of costs being either underestimated or overestimated for each component). A standard statistical technique called Monte Carlo simulation is used to assess the overall effect such uncertainties could have on the total estimate of rehabilitation liability.

In New Zealand, the financial assurance amounts are then set by council based on the 80 percentile (and in some cases, where other beneficiaries are included, the 95 percentile, although this is understood to be changing) cost amount (A. Paul *pers comm*).

Financial assurance amounts set in this manner factor in the risk of cost increases during rehabilitation and typically result in much higher amounts than the deterministic estimations used in most jurisdictions (including Victoria).

### Post-closure trust funds

Post-closure trust funds are used in New Zealand to pay for the ongoing management, maintenance and monitoring of land that has been rehabilitated and relinquished back to government. An example is the Martha Trust that has been established at the Waihi Gold mining operations (OceanaGold 2015):

- The Martha Trust will oversee a post-closure trust fund that generates annual interest. This interest will allow the trust to manage, monitor and maintain the site in perpetuity. In addition, the trust will provide money to take out insurance cover for residual risks at the site.
- Waihi Gold maintains a capitalisation bond during operations in addition to the company's rehabilitation bond. The capitalisation bond ensures that a sum of money will always be available to allow the trust to carry out its activities, even in the unlikely event that mining finishes early, and the company walks away from the site.
- Once closure is complete, a sum of money will be handed over by the company to allow the trust to carry out its functions, and the capitalisation bond will no longer be required.

The trustees for the Martha Trust will be nominated at mine closure when the trust become operative. The trustees will include representatives nominated by the district and regional councils and the local Maori people (Hauraki Council 2012).

### Key points

- Financial assurance practice has been largely industry-driven in consultation with Provincial Councils and other parties.
- 100% financial assurance held by government.
- Financial assurance required in the form of an unconditional bank guarantee.
- Probabilistic cost estimation used in setting financial assurance amount.
- Quantitative risk assessments used to inform financial assurance amount and residual risk.
- Post-closure trust funds established to pay for the ongoing management, maintenance and monitoring of rehabilitated sites.
- A capitalisation bond at the Waihi Mine guarantees that money will be available for the trust fund even in the event of operator insolvency.

## 3.13 Extractive industries

### Levy

In some jurisdictions there is no financial assurance for aggregate quarrying sites (i.e. sand and gravel quarries). In the Province of Manitoba, Canada, the governments collect a levy to pay for rehabilitation, calculated based on per tonne of material removed, and the government uses this funding to co-ordinate and pay for rehabilitation (C. Liske, *pers comm*).

### Key points

- Production levy contributes to government owned pooled fund.
- Pooled fund can be used by government for rehabilitation on any tenement.
- Government co-ordinates rehabilitation.

## 4 Assessment of financial mechanisms

### 4.1 Adequacy of current rehabilitation bonds

Table 1 shows the rehabilitation bonds currently held for the Hazelwood Mine, the Yallourn Mine and the Loy Yang Mine (\$15 million, \$11.46 million and \$15 million, respectively). Table 1 also shows the operators' self-reported estimates of current rehabilitation liability, as reported in their 2015 Schedule 19 Annual Activity and Expenditure returns (\$73.4 million, \$46 million and \$53.7 million, respectively).

**Table 1 Current bond and 2015 estimated liabilities**

Mine	Total area disturbed ha	Rehabilitation bond held \$	Estimate of rehabilitation liability from 2015 returns \$
Hazelwood	2543	\$ 15,000,000	\$ 73,400,000
Yallourn	1768	\$ 11,460,000	\$ 46,000,000
Loy Yang	1160	\$ 15,000,000	\$ 53,700,000

It is clear from this information that the rehabilitation bonds are substantially below current estimates of rehabilitation liability at each of the three sites.

In addition the self-assessed amounts may be much lower than the actual cost of rehabilitation. Incidents at two of the mines over the past eight years, including the 2014 Hazelwood Coal Mine Fire, the 2012 Morwell River diversion failure at the Yallourn Mine (EER 2014) and the 2007 Yallourn Mine Batter failure (Victorian Government 2008) have raised concerns about geotechnical, hydrogeological and fire prevention issues.

The Yallourn Mine Batter failure led to the amendment of Section 7C of the MRSD Act to provide for the Minister for Earth Resources to declare a specific mine or quarry where there are geotechnical or hydrogeological factors within the mine or quarry that pose a significant risk to:

- a) public safety
- b) the environment
- c) infrastructure.

The Latrobe Valley coal mines were declared under Section 7C and a Technical Review Board comprised of eminent Australian and international technical experts appointed to act in a review capacity.

While the 2015 self-reported estimates of rehabilitation liability by the mines do factor in, to some extent, the emergence of the geotechnical, hydrogeological and fire prevention risk factors, there is still uncertainty regarding the best way of managing closure to minimise these issues. It is likely that further increases in estimated rehabilitation liability will occur as these risk factors are further investigated and resolved.

For example, Hazelwood's 2014 Annual Activity and Expenditure Return estimated a rehabilitation liability of between \$46 million and \$91 million based upon whether particular batter stabilisation works would be required (Victorian Government 2015). This illustrates the sensitivity of rehabilitation liability estimates to the technical uncertainty associated with these risk factors.

A Rehabilitation Bond Review Project commissioned by DEDJTR has recently been completed (Victorian Government 2015). The objective of the project was to understand and to estimate the rehabilitation liabilities for the three Latrobe Valley coal mines. This work will provide independent estimates of rehabilitation liability that can further inform discussion of financial mechanism for rehabilitation.

## 4.2 Future uncertainties and risks

An assessment of financial mechanisms for rehabilitation needs to consider the current mine life expectancies of the Latrobe Valley coal mines as well as the potential for premature closure (planned or unplanned) to occur. The current estimated lives of the three mines based on current reserves of coal are:

- Hazelwood – 2031
- Yallourn – 2032
- Loy Yang – 2048

Based on these estimates, there is between 15 and 32 years remaining to resolve the current technical issues with rehabilitation, undertake further progressive rehabilitation and plan for final closure.

In addition, the mines and power stations of the Latrobe Valley are classified as essential services for the State of Victoria. They have therefore been previously considered too important to the State's power supply for the government to allow them to close.

However, the future of brown coal as a source of energy is currently subject to a greater than usual degree of market uncertainty due to factors such as:

- falling demand for electricity in south-eastern Australia, which has led to over supply in the national electricity market (AEMO 2015)
- competition from the renewable energy sector which is going through a period of rapid technological advancement (Parkinson 2014)
- the potential for Australia to re-introduce carbon pricing as a future response to climate change.

Given these market uncertainties, in particular the falling demand for electricity and current over capacity, the risk of one or more of the three mines ending operations prior to the exhaustion of current reserves has to be taken into consideration when assessing financial mechanisms for rehabilitation. If the current over supply of electricity in the national electricity market continues, it may be possible for one of the power stations to stop operating without causing a shortage of supply.

## 4.3 Assessment of financial mechanisms

### 4.3.1 Options assessed

A range of options for alternative mechanisms to ensure the rehabilitation of the Latrobe Valley Coal Mines have been assessed. The options were assessed in terms of their practicality, sustainability, efficiency and effectiveness, as requested under Terms of Reference 10 (c), and, where applicable, against the ten guiding principles for a good security bond model (see Section 2.1).

The options were assessed under three categories of actual or potential closure costs:

- **Expected closure costs** – based on current and future rehabilitation plans and rehabilitation bond estimations approved by DEDJTR. The assessment of options under this category include consideration of their potential to promote progressive rehabilitation.
- **Long term, post-closure costs** – associated with activities such as ongoing water treatment, aquifer dewatering, maintenance, monitoring and inspection.
- **Unplanned post-closure costs** – arising from unpredictable issues, such as the discovery of additional liability, the failure of technical solutions to resolve closure issues, or the structural failure of landforms.

The consideration of three categories of costs is consistent with current trends in financial assurance management and allows greater flexibility in addressing the various cost risks associated with mine closure.

The alternative options assessed relating to **expected closure costs** are:

- **Single-step increase** – a single-step increase of existing rehabilitation bonds to achieve full financial assurance coverage.
- **Multi-step increase** – a pre-defined schedule of bond increases to progressively achieve full financial assurance coverage.
- **Bond discount** – the single-step or multi step increase options with additional bond discount.
- **Trust fund for rehabilitation** – using a trust fund to provide supplementary financial assurance coverage.
- **Insurance-based** – using insurance to provide supplementary financial assurance coverage.
- **Pooled fund** – using a pooled fund to provide supplementary financial assurance coverage.

The options assessed relating to **unplanned post-closure costs** are:

- **Unplanned events insurance** – using insurance to mitigate the risk of post-closure unplanned costs.
- **Unplanned events fund** – using a trust fund to provide funds for unplanned post-closure costs.

The option assessed relating to **long term, post-closure costs** is:

- **Post-closure trust fund** – using a trust fund to cover the costs of post-closure management, maintenance and monitoring of the sites.

In addition, the issue of rehabilitation liability calculation is briefly discussed, as all financial assurance systems are reliant on the accurate estimation of liability.

### 4.3.2 Expected closure costs

#### Single-step increase

Under this option, each of the Latrobe Valley coal mines would be required to increase their current rehabilitation bond in a single-step to equal the current rehabilitation liability. Increasing or decreasing rehabilitation bonds following a re-calculation of rehabilitation liability is standard practice under the current rehabilitation bond system.

For example, if the regulator accepted the operators' estimates of rehabilitation liability as submitted in the 2015 rehabilitation liability assessments, the increase would be as shown in Table 2. In such a case, the bonds would increase by factors of between 3.6 and 4.9.

**Table 2 Potential rehabilitation bond increase**

Coal mine	Current rehabilitation bond (\$ million)	Rehabilitation liability estimated in 2015 return (\$ million)	Potential bond increase (\$ million)	Potential bond increase factor
Yallourn	\$11.46	\$ 46.00	\$34.54	4.0
Hazelwood	\$15.00	\$ 73.40	\$58.40	4.9
Loy Yang	\$15.00	\$ 53.70	\$38.70	3.6

The regulator may request higher bonds than the increased amounts shown in Table 2. For example, higher bonds could be requested if the current rehabilitation plans were updated to incorporate more onerous rehabilitation requirements. In such a case, the bond increase factors would be even higher.

The increased rehabilitation bond could continue to be provided by an unconditional bank guarantee. Alternatively, a cash guarantee could be provided. However, provision of a cash bond would be a change in practice, as cash payments are proposed to only be accepted for bonds up to \$20,000 in the rehabilitation bond policy reform package (Victorian Government 2015) (see Section 3.1.1).

The increase of bonds to achieve full financial assurance coverage would cover the State for 100% of the estimated rehabilitation liability. However, even with the added incentive of reducing a bond that was now much higher, operators may be reluctant to undertake substantial progressive rehabilitation for the following reasons:

- The cost of rehabilitation to reduce the bond is likely to be greater than the financial benefits (e.g. reduced cost of capital and lower bank guarantee maintenance fees) that come from having a reduced bond.
- In the absence of agreed end landforms and end land uses for the sites, and with current technical uncertainties concerning rehabilitation methods, there is a risk that rework could be required if some aspects of rehabilitation are undertaken prematurely.

The cost to operators of a cash bond would be substantially more than the cost of maintaining a bank guarantee of equivalent value, but would create a stronger financial incentive for operators to undertake progressive rehabilitation.

The advantages of the single-step increase option include:

- The State would be covered for 100% of agreed rehabilitation liability.
- The option would be consistent with the current administration of the Victorian rehabilitation bond system.
- A bond set at 100% of the estimated rehabilitation liability may provide financial incentive for operators to undertake progressive rehabilitation.

The disadvantages of the single-step increase option include the following:

- Operators would be subject to a large one-off bond increase that could potentially create financial hardship. The greater the gap between the current rehabilitation bond and the agreed rehabilitation liability, the greater the potential for financial hardship.
- The cost of rehabilitation to reduce the bond is likely to be greater than the financial benefits that come from having a reduced bond.

### **Multi-step increase**

Under this option, each of the Latrobe Valley coal mines would be required to increase their current rehabilitation bond over time by an agreed number of increments until it equaled the rehabilitation liability. The payment schedule and percentages would be agreed between the regulators and operators. The greater the gap between the current rehabilitation bond and the estimated rehabilitation liability, the more attractive this option is likely to be to operators.

The use of a bond implementation plan to progressively increase financial assurance coverage is allowed under financial hardship provisions in Section 8 of the DEDJTR rehabilitation bond guidelines (DEDJTR 2015).

For example, the operators could be required to increase the amount of their rehabilitation bond over five evenly spaced incremental payments. One such payment schedule is shown in Table 3 with payments occurring every second year over eight years. If the rehabilitation liability was recalculated or CPI-adjusted during the period of the payment schedule and the bond amount increased or decreased, then the individual payment amounts would also vary.

**Table 3 Example of multi-step increase option**

Coal mine	Current rehabilitation bond (\$ million)	Bond increase* (\$ million)					Final rehabilitation bond (100% of liability) (\$ million)
		Initial (1/5 of remaining gap)	Year 2 (1/4 of remaining gap)	Year 4 (1/3 of remaining gap)	Year 6 (1/2 of remaining gap)	Year 8 (all of remaining gap)	
Yallourn	\$11.46	\$6.91	\$6.91	\$6.91	\$6.91	\$6.91	\$ 46.00
Hazelwood	\$15.00	\$11.68	\$11.68	\$11.68	\$11.68	\$11.68	\$ 73.40
Loy Yang	\$15.00	\$7.74	\$7.74	\$7.74	\$7.74	\$7.74	\$ 53.70

\*bond increase would be calculated based on remaining gap at time of each payment

The increases in rehabilitation bonds could continue to be provided by unconditional bank guarantees. Alternatively, cash guarantees could be provided but this would require a change in government practice and represent a substantial cost increase for operators.

The advantages of the multi-step increase option include:

- The State would be covered for 100% of agreed rehabilitation liability by the end of the scheduled period for bond increases.
- Consistent with the current administration of the Victorian rehabilitation bond system.
- Reduce the financial hardship for operators that may be associated with the single-step increase option.
- Provides opportunity for operators to undertake progressive rehabilitation to reduce their rehabilitation liability before full financial assurance coverage is reached.
- Provides greater financial certainty to operators who would be better able to plan for the regular increases in bond amount.

The disadvantages of the multi-step increase option include:

- The State would be exposed to rehabilitation default risk for longer period than under the single-step increase option.
- There would be a risk of mine closure (planned or unplanned) occurring before full financial assurance coverage is achieved. In the case of early closure (as distinct from rehabilitation default) it would still be expected that the operator would undertake rehabilitation to the value of the full amount of the rehabilitation liability. However, any closure of a mine where financial assurance is less than the rehabilitation liability represents a risk to the State.
- The cost of rehabilitation to reduce the bond is likely to be greater than the financial benefits that come from having a reduced bond.

### Bond discount

Under this scenario, either the single-step option or the multi-step option could be coupled with a performance-based bond discount, such as the two-track bond model that DEDTR is implementing as part of its rehabilitation bond policy reform package (Victorian Government 2015) (see Section 3.1.1).

The 25% bond discount, available under the two-track bond model, would be made available to the Latrobe Valley coal mine operators provided they meet the eligibility criteria. Rather than stepping up to full financial assurance coverage, the operators would initially only be required to step up to 75% financial assurance coverage. Full financial assurance coverage would only be required once the operations ceased production, provided they continued to meet the eligibility criteria. If the operations failed to meet the eligibility criteria at any time, they would forfeit the 25% bond discount.

Note however that high-risk sites including coal mines are expressly excluded from the proposed two-track bond model (Victorian Government 2015).

The advantages of the bond discount option include:

- Consistent with proposed reforms to the administration of the Victorian rehabilitation bond system (except for the exclusion of high risk sites).
- Reduces financial hardship for operators that may be associated with a single-step increase to full financial assurance coverage.

The disadvantages of the bond discount option include:

- The State would be exposed to rehabilitation default risk during the period the discount applies.
- A risk of mine closure (planned or unplanned) occurring before full financial assurance coverage is reached (as described under multi-step increase option above).
- The cost of rehabilitation to reduce the bond and achieve eligibility for the 25% discount is likely to be greater than the financial benefits that come from having a reduced bond.

### **Trust fund for rehabilitation**

A trust fund for rehabilitation could be established by the operators to supplement the use of rehabilitation bonds.

The Loy Yang Complex Agreement (LYCA) is an example of such a trust fund (EME, LYP & SECV 1997). Under the tripartite Agreement between the Loy Yang A power station, Loy Yang B power station and the State of Victoria, rehabilitation costs for the Loy Yang Mine are to be proportionately assigned to the users of coal from the mine. The three parties are to open a joint bank account with a trading bank. Contributions will be paid into that account or an irrevocable standby letter of credit will be provided. Contributions to the trust fund are to commence in 2023 with a tenth of the required contribution paid in each year until 2032. The fund would therefore match the final rehabilitation liability more than 10 years prior to the planned closure in 2048 (AGL 2015).

A trust fund such as the LYCA, with the government as a signatory, provides additional assurance to the State that funds will be available to undertake site rehabilitation.

A trust fund does not provide the same level of guarantee as a rehabilitation bond supported by an unconditional bank guarantee. However, if established appropriately, it sits towards the secure end of the spectrum of risk. The risks associated with a trust fund can be minimised by steps including:

- using the government as a signatory
- investing the money in a bank
- guaranteeing later contributions by an unconditional bank guarantee
- monitoring and reporting on fund levels
- setting up the fund so that if any of the signatories becomes insolvent, the money is available to the regulator and is not seized by other creditors.

The advantages of the trust fund for rehabilitation option include:

- If established correctly, the funds would be protected even in the event of one of the signatories becoming insolvent.
- Demonstrates operator commitment.
- Increases the level of assurance that funds will be available to undertake site rehabilitation.
- Can be used to supplement other financial assurance instruments, such as rehabilitation bonds.
- As funds can only be used for rehabilitation, this option provides incentive for progressive rehabilitation to be undertaken.

The disadvantages of the trust fund for rehabilitation option include:



- If the fund was not established correctly, there is a risk it could be seized by creditors in the event of one of the signatories becoming insolvent.
- A risk of mine closure (planned or unplanned) occurring before the fund equals the rehabilitation liability.
- An opportunity cost is incurred by operators because the funds or financial instruments held in trust cannot be put to alternative use.
- Additional financial imposition on the operator.
- Additional administrative burden for regulator and operator.

### **Insurance-based**

The insurance-based option would allow insurance to replace or supplement the use of rehabilitation bonds.

For example:

- Insurance could be taken out by operators to insure against the risk that rehabilitation costs exceed the rehabilitation bond.
- Insurance could be taken out by government to cover known gaps between rehabilitation liability and the rehabilitation bond (such as under a discount bond system) in the event of rehabilitation default by the operator.
- Insurance could be taken out by government to guarantee that mine rehabilitation obligations are met in the event of default by an operator. However, a commercial insurance product of this type does not appear to be widely available in the Australian market.

Insurance is typically held to guard against sudden and accidental events, and gradual, slow to develop pollution events.

A moral hazard may arise with the use of insurance by operators where the cost of defaulting on rehabilitation is lower than the cost of undertaking rehabilitation. However, the insurer will mitigate this risk by the wording and conditions of the insurance agreement.

In addition to insurance, a surety bond issued by an insurance company could be taken out by the operator to provide funds in the event of rehabilitation default. The government could be named as a beneficiary of the surety bond.

As surety bonds are typically taken out for a specific period of time, the amount of coverage can be amended at the end of each contract period. However, the insurer is also given an opportunity to reassess the risks under the contract which may result in premium increases.

The advantages of the insurance based option include:

- The option could supplement other financial assurance instruments, such as rehabilitation bonds, to reduce overall risk.
- The government could be provided with rehabilitation funds in the event of rehabilitation default by the operator.

The disadvantages of the insurance based option include the following:

- The option does not provide incentive for progressive rehabilitation.
- Insurance products may be unavailable.
- Insurance premiums may be expensive and are subject to fluctuation.
- There is a risk that the insurer will not pay out.
- Potential legal costs involved in making an insurance claim.
- Potential for moral hazard.

- Additional financial imposition on the operator.
- Additional administrative burden for the regulator and operator.

### **Pooled fund**

Under this option, the three operators would pay an annual levy into a government-owned rehabilitation fund. The fund could be used by government to help pay for rehabilitation at any of the three coal mines in the event of their default. In return, the operators would be allowed to maintain a reduction in their rehabilitation bond.

Using the Northern Territory as an example (see Section 3.2), the operators would be required to pay an annual levy equal to 1% of their rehabilitation bond, but would receive a 10% reduction in their financial assurance as compensation. Other combinations of bond reduction and levy amount could be considered.

Pooled funds are only viable when:

- There are many participants, enabling a small levy to generate a sizeable fund.
- The participants represent a diversity of risk profiles minimising the risk of multiple payouts.

With only three participants, a high levy would be required to generate a sizeable fund. Even a small levy would increase the financial burden to the operators, unless accompanied by a substantial reduction in the percentage of financial assurance coverage required - which in turn would then leave the State exposed to rehabilitation default risk. In addition, the three participants do not represent a large diversity of risk profiles.

### **4.3.3 Unplanned post-closure costs**

The two options outlined below would be designed to mitigate the risk to government of unplanned costs following site relinquishment.

The geotechnical and hydrogeological risk factors that led to the mines being declared under Section 7C of the MRSD Act will remain post-closure. These risk factors along with other residual risks such as fire could result in unplanned post-closure costs.

The period remaining before the closure of the Latrobe Valley coal mines provides an opportunity for research and rehabilitation trials to be undertaken to better understand and mitigate key closure risk factors, such as the long term stability of post-closure landforms. Such research could reduce the risk of significant, unplanned post-closure costs to the extent that financial assurance for unplanned events is not required.

### **Unplanned events insurance**

The unplanned events insurance option would involve the use of insurance to mitigate the risk to government of unplanned post-closure costs.

Using New Zealand as an example (see Section 3.12), insurance could be obtained to cover residual closure risks. The insurance could be taken out by government, or by a post-closure trust fund established to manage the site.

The operator could be required to maintain a separate bond during operations (such as the New Zealand capitalisation bond) that would guarantee the availability of money for post-closure insurance in the event of operator insolvency. Upon site relinquishment, the operator would provide funds to pay for the post-closure insurance and the 'capitalisation' bond would be returned.

The regulator and operator, with advice from independent technical specialists, could identify the residual risks for which insurance is required and determine the appropriate amount of cover. The existing Technical Review Board established to oversee technical issues at the Latrobe Valley coal mines may be suitable for

overseeing this process. A quantitative risk assessment process could be used to identify and quantify the residual risks.

The advantages of the unplanned events insurance option include:

- State would be afforded cover for residual post-closure risks that could result in unplanned costs.
- Insurance is an appropriate financial instrument for managing unplanned costs.
- Provisioning for post-closure costs helps the operator relinquish the site.
- The option is consistent with the rationale behind declaring the Latrobe Valley coal mines under Section 7C of the MRSD Act.
- Could draw upon expertise of existing Technical Review Panel.
- A separate bond during operations could guarantee the availability of money for post-closure insurance in the event of operator insolvency.

The disadvantages of the unplanned events insurance option include:

- Additional financial imposition on the operator.
- Additional administrative burden for regulator and operator.
- Potential difficulty in identifying and quantifying risks to be insured against and appropriate level of cover.
- Uncertain regulatory means for implementing option.

### **Unplanned events fund**

The unplanned events fund option would involve the establishment of a fund to mitigate the risk to government of unplanned post-closure costs.

Using the Saskatchewan Institutional Control Program as an example (see Section 3.10), an operator seeking to relinquish a site would pay an amount into a trust fund to cover the present value of the future estimated costs associated with unplanned post-closure events. In the case of Saskatchewan, the required contribution amount (for sites with tailings or engineered structures) is equal to 20% of the value of the future estimated costs associated with the monitoring and maintenance of the site.

Alternatively, the regulator and operator, with advice from independent technical specialists, could identify the residual risks that the unplanned events fund is required to cover. An estimate of the required size of the fund could be developed on this basis. The existing Technical Review Board may be suitable for overseeing this process. A quantitative risk assessment process could be used to identify and quantify the residual risks.

The trustees overseeing the trust fund could comprise representatives from state and local governments and the local community, along with technical experts.

The operator could be required to maintain a separate bond during operations to guarantee the availability of money for the unplanned events fund in the event of operator insolvency. Upon site relinquishment, the operator would provide funds to pay to the post-closure fund and the bond would be returned.

The trust fund could potentially be a common fund proportionately contributed to by each of the three coal mines. However, if a common fund was established there would be a risk that unplanned events at a single site could drain the entire fund.

The advantages of the unplanned events fund option include:

- The State would be afforded cover for residual post-closure risks that could result in unplanned costs.
- Provisioning for post-closure costs helps the operator relinquish the site.
- The option is consistent with the rationale behind declaring the Latrobe Valley coal mines under Section 7C of the MRSD Act.
- There is option to draw upon expertise of existing Technical Review Panel.

- A separate bond during operations could guarantee the availability of money for the unplanned events fund in the event of operator insolvency.

The disadvantages of the unplanned events fund option include:

- additional financial imposition on the operator
- additional administrative burden for regulator and operator
- potential difficulty in identifying and quantifying risks and determining size of fund.

#### 4.3.4 Post-closure trust fund option

##### Context

Mining projects in Australia are finding it increasingly difficult to meet regulatory requirements for site relinquishment and timeframes for the traditional post-closure maintenance and monitoring period have increased dramatically. In Queensland, for example, the DEHP advises that many major mining sites will require up to 50 years of post-rehabilitation monitoring before relinquishment (Queensland Audit Office 2014).

Long-term post-closure management, maintenance and monitoring of the Latrobe Valley coal mines will almost certainly be required due to the time required to achieve geotechnical and hydrogeological stability at the sites.

The financial assurance that applies during mine operations may not be the most appropriate assurance to cover post-closure risks and can leave mining companies responsible for non-productive assets for many decades. At many mining sites, post-closure costs are likely to be incurred in-perpetuity.

The *Leading Practice Sustainable Development Program Mine Closure and Completion Handbook* (DITR 2006) suggests that operators should consider the establishment of trust fund or other financial arrangement that would generate income for the ongoing management of rehabilitated areas, if this mechanism provides a means for early relinquishment.

##### Fund characteristics

A post-closure trust fund could be established to provide funds to cover long-term post-closure costs, including any in-perpetuity management costs. The post-closure trust fund proposed for the Stockman Project (see Section 3.1.1), although not yet implemented, provides a precedent for establishing such a trust. The interest generated by the trust would be sufficient to fund ongoing post-closure activities.

The size of a fund for this purpose would need to be based on the management, maintenance and monitoring program negotiated between the regulator and operator, potentially involving the Technical Review Board or other experts.

If the fund was also designed to meet separate community objectives, then these objectives and an estimate of associated costs and contributions could be negotiated between the operators, community representatives and the various levels of government.

The trustees overseeing the trust could comprise representatives from state and local governments and the local community. The trustees could receive advice from experts such as the Technical Review Board.

Operators could be required to maintain a bond during operations to guarantee the availability of money for the post-closure trust fund in the event of operator insolvency. Upon site relinquishment, the operator would provide funds to pay to the post-closure fund and the guarantee would be returned.

As outlined for the unplanned events fund option, the trust fund could potentially be a common fund proportionately contributed to by each of the three coal mines. If a common fund were established then the trustees overseeing the fund would have the discretion to prioritise expenditure across the three sites enabling an integrated regional approach to post-closure management and creating efficiencies of scale.

The advantages of the post-closure trust fund option include:

- The State would be afforded cover in perpetuity for routine post-closure costs.
- Regulatory precedence exists for a post-closure trust fund.
- Provisioning for post-closure costs helps the operator relinquish the site.
- A common fund between the three coal mines would enable an integrated regional approach to post-closure management
- A separate bond during operations could guarantee the availability of money for the post-closure trust fund in the event of rehabilitation default.

The disadvantages of the unplanned events fund option include:

- additional financial imposition on the operator
- additional administrative burden for regulator and operator.

### **Post-closure community fund**

A post-closure trust fund could also be used to help reduce the social and economic impacts of mine closure of the Latrobe Valley community. Similar to a number of other existing trust arrangements including the NSW Mine Subsidence Board (see Section 3.3.2), the fund could be used for funding programs that meet the existing and future needs of the community.

The size of the fund could be increased to enable it to perform this additional role. In such a case, there could be grounds for state, local (and perhaps federal) governments to make in-kind contributions to the fund.

It would be important to keep such a trust separate from any unplanned events trust fund or post-closure trust fund so that the funds in each were protected from the costs of activities they were not designed to fund.

### **4.3.5 Estimation of rehabilitation liability**

All financial assurance systems rely on the accurate estimation of rehabilitation liability. However, experience has shown that typical deterministic means of estimating liability, such as through the use of a bond calculator tool, tend to underestimate the actual costs of rehabilitation due to factors such as:

- An inherent assumption that rehabilitation will be able to proceed as planned, whereas problems inevitably arise and commonly result in increased costs. Such cost increases often exceed the contingency factored into the original calculation.
- Failure of proposed technical methods to achieve their objectives, which can require substantial additional cost to rectify.
- Rehabilitation costs trending up over time as regulator and community expectations change and as management of technical issues becomes more elaborate.

To help overcome these issues, probabilistic cost estimations, such as are commonly used for setting rehabilitation guarantees in New Zealand (see Section 3.12), can be undertaken to identify cost risks and provide a more robust estimate of rehabilitation liability. Probabilistic estimations are also useful for ensuring that rehabilitation strategies focus on key risks. The Minerals Council of Australia (MCA) submission to the Inquiry advocates bonds that allow for unforeseen phenomena on a probabilistic basis (MCA 2015).

Probabilistic cost estimations could be adopted as part of the process of bond setting for the Latrobe Valley coal mines. Ideally, as in New Zealand, such cost estimations would be linked to quantitative rehabilitation risk assessments.

Probabilistic cost estimations can look at two sources of cost risk:

- The cost risks associated with the proposed rehabilitation activities (i.e. assumed quantities and cost rates).
- The risk of additional activities being required as a result of unplanned events or unidentified liabilities.

Both these areas of risk would ideally be considered.

## 5 Conclusions

The primary purpose of financial assurance for mining projects is to provide a high degree of certainty that adequate funding will be available to undertake final rehabilitation in the event of default by the operator. A secondary purpose is to promote progressive rehabilitation.

A cross-jurisdictional review has identified range of different financial mechanisms used to ensure that the rehabilitation of mining operations is properly funded and implemented. A number of trends have been emerging over recent years including:

- the increased use of trust funds to enable post-closure management, including in perpetuity
- a greater focus on cost risks associated with unplanned events, particularly post closure
- the adoption of discount bond systems to reward good performance and encourage progressive rehabilitation
- the use of more sophisticated liability calculation tools and adoption of probabilistic cost estimation methods to more accurately determine rehabilitation liability.

The emergence of these trends is recognition of issues with traditional financial assurance mechanisms, such as the underestimation of rehabilitation liability, difficulties in meeting requirements for site relinquishment and problems faced by regulators in encouraging progressive rehabilitation.

Current rehabilitation bonds for the Latrobe Valley coal mines are substantially lower than the rehabilitation liability of the sites. This presents a risk to the State and sits within the context of broader issues including:

- geotechnical, hydrogeological and fire prevention risks at the three mines which result in a degree of technical uncertainty regarding appropriate methods of rehabilitation
- market uncertainty due to falling electricity demand (which has led to over supply), increasing competition from the renewables sector and the potential for future carbon pricing. Such uncertainty could result in the early closure of one of more sites.

Victoria currently has a full financial assurance system for mining projects that require operators to provide rehabilitation bonds equal to 100% of estimated liability. The State is currently implementing a performance-based discount bond system, but the coal mines are deemed ineligible due to their high rehabilitation risk.

A range of options for alternative financial mechanisms were assessed for their potential to ensure that rehabilitation of the mines is undertaken as required under the *Mineral Resources (Sustainable Development) Act 1990*. The options were:

- **Single-step increase** – a single-step increase of existing rehabilitation bonds to achieve full financial assurance coverage.
- **Multi-step increase** – a pre-defined schedule of bond increases to progressively achieve full financial assurance coverage.
- **Bond discount** – the single-step or multi step increase options with additional bond discount.
- **Trust fund for rehabilitation** – using a trust fund to provide supplementary financial assurance coverage.
- **Insurance-based coverage** – using insurance to provide supplementary financial assurance coverage.
- **Pooled fund coverage** – using a pooled fund to provide supplementary financial assurance coverage.
- **Unplanned events insurance** – using insurance to mitigate the risk of post-closure unplanned costs.
- **Unplanned events fund** – using a trust fund to provide funds for unplanned post-closure costs.

- **Post-closure trust fund** – using a trust fund to cover the costs of post-closure management, maintenance and monitoring of the sites.

A post-closure trust fund could also be used to help reduce the social and economic impacts of mine closure of the Latrobe Valley community

The greater the gap between the rehabilitation bond and the rehabilitation liability, the greater the risk taken on by the State. In considering the options for financial mechanisms the State has to assess the likelihood and consequences of rehabilitation default, its willingness to take on risk, and balance this against the commercial needs of the operators. It is up to the operators to present a case for any financial hardship that may occur from increasing the bond amounts.

It is not clear that any of the options assessed provide strong financial or other incentives for the mine operators to undertake significant progressive rehabilitation. There are inherent risks in leaving untested aspects of rehabilitation until the end of operations and it is important that such a situation is avoided in the Latrobe Valley.



## 6 References and personal communications

### References

AEMO (2015). *Electricity Statement of Opportunities for the National Electricity Market*. Australian Energy Market Operator. Version 2. Published August 2015.

AGL (2015). *The Hazelwood Coal Mine Fire Inquiry - Submission of AGL Loy Yang Pty Ltd*. Mine Rehabilitation Terms of Reference Date: 24 August 2015.

DEDJTR (2015). *Establishment and Management of Rehabilitation Bonds for the Mining and Extractive Industries*. Department of Economic Development, Jobs, Transport and Resources - Earth Resources. Online version, ISBN: 978-1-74199-757-6 <http://www.energyandresources.vic.gov.au/earth-resources/licensing-and-approvals/minerals/guidelines-and-codes-of-practice/establishment-and-management-of-rehabilitation-bonds-for-the-mining-and-extractives-industries>. Accessed 28 October 2015.

DEHP (2014a). *Financial assurance under the Environmental Protection Act 1994*. Department of Environment and Heritage Protection. 130502, EM1010, Version 2, 2014.

DEHP (2014b). *EHP Financial Assurance Calculator*. Department of Environment and Heritage Protection. March 2014.

DEHP (2015). *Residual risk payments for an environmental authority*. Department of Environment and Heritage Protection. <https://www.business.qld.gov.au/business/running/environment/licences-permits/financial-assurance-rehabilitation/residual-risk-payments>. Last reviewed 16 Oct 2013, accessed 21 Oct 2015.

DITR (2006). *Leading Practice Sustainable Development Program for the Mining Industry, Mine Closure and Completion Handbook*. Australian Government. Department of Industry Tourism and Resources. 2006.

DMP (2014). *Mining Rehabilitation Fund, Fact Sheet, May 2014 Compulsory Year*, Department of Mines and Petroleum, JAN14\_2874, 2014.

DPI (2010). *Establishment and Management of Rehabilitation Bonds for the Mining and Extractive Industries*. Earth Resources Regulation, Department of Primary Industries. September.

DPI (undated) *Mineral Resources (Sustainable Development) Act Review – Stage 2, DRAFT Discussion Paper No 5 – Rehabilitation Bonds*. Department of Primary Industries. [DEDJTR.1008.001.0232]

DSD (2015). *Guidelines for miners: mining approval processes in South Australia*. Government of South Australia. Department of State Development. Publication MG1 May 2015 V2

EC (2006). *Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC*. European Commission. 2006/21/EC.

EC (2009). *Commission Decision of 20 April 2009 on technical guidelines for the establishment of the financial guarantee in accordance with Directive 2006/21/EC of the European Parliament and of the Council concerning the management of waste from extractive industries*. Notified under document number C(2009) 2798. European Commission. 2009/335/EC.

EER (2014). *Yallourn Coal Mine Inquiries. Review of the Morwell River diversion failure*. Energy and Earth Resources website. Updated 10 February 2014. Accessed 4 November 2015.

<http://www.energyandresources.vic.gov.au/earth-resources/information-for-community-and-landholders/mining-and-extractives/latrobe-valley-coal-mines/regulatory-reviews/yallourn-coal-mine-inquiries>

EME, LYP & SECV (1997). Loy Yang Complex Agreement between Edison Mission Energy Australia Limited, Loy Yang Power Limited and SECV 29 March 1997 (redacted).

EPA (2012). *Closed Landfill Guidelines*. Environment Protection Authority Victoria. Publication number 1490 December.

EPA (2014). *Draft position statement. EPA position on provision of financial assurance for licences and works approvals*. Environment Protection Authority Victoria. Publication number 1568, June.

EPA (2015a). *Draft guideline. Financial assurance calculation for landfills, prescribed industrial waste management (PIW), container washing, and PIW composting*. Environment Protection Authority Victoria. Publication 1584, February.

EPA (2015b). *Draft guideline. Types of financial assurance*. Environment Protection Authority Victoria. Publication 1586, February.

EPA (2015c). *Best Practice Environmental Management Document. Siting, design, operation and rehabilitation of landfills*. Environment Protection Authority Victoria. Publication 788.3, August.

GG (2015). Inquiries Act 2014, *Appointment of a Board of Inquiry into the Hazelwood Coal Mine Fire*, Order in Council. Victoria Government Gazette. No. S 123 Tuesday 26 May 2015.

Hauraki Council (2012). *2012-2022 Hauraki Long-Term Plan*. Volume 1. Hauraki District Council.

KPMG (2011). *Options for Financial Assurance for Rehabilitation of Mine and Quarry Sites in Victoria*, KPMG, 2011. Report prepared by KPMG for Department of Primary Industries.

Leybourne, M (2014). Ensuring Rehabilitation into the Future – The Western Australian Mining Rehabilitation Fund, in Proceedings Second Australian Conference on Life of Mine 2014, pp 441–447 (The Australasian Institute of Mining and Metallurgy: Brisbane).

MonTec (2008). *Guidelines on Financial Guarantees and Inspections for Mining Waste Facilities*. Final Report 2007/S 49-059670. Prepared for European Commission by MonTec GmbH.

MCA (2015). Submission to Hazelwood Mine Fire Inquiry (reopened). Minerals Council of Australia Victorian Division. 24 August 2015.

MRT (2013). *The Tasmanian security deposit system for mining and exploration tenements*. Mineral Resources Tasmania. Publication Tasmanian Geological Survey Record 2013/05. 2013

NSW CS&E (2014). *Environmental risk & responsibility and insurance arrangements for the NSW CSG industry*. NSW Government. NSW Chief Scientist & Engineer. May 2014.

NSW Government (2012). *Mine Subsidence Compensation Act 1961, Mine Subsidence Compensation Regulation 2012*. NSW Government. Publication 2012 No 443, 31 August 2012.

NSW Industry and Investment (2010) *Rehabilitation cost estimate guidelines*. NSW Government Department of Industry and Investment, Environmental Sustainability Unit. Publication EDP1 2010.

NSW MSB (2015). *Mine Subsidence Board*. NSW Government Mine Subsidence Board. [http://www.minesub.nsw.gov.au/templates/mine\\_subsidence\\_board.aspx?edit=false&pageID=3776](http://www.minesub.nsw.gov.au/templates/mine_subsidence_board.aspx?edit=false&pageID=3776). Accessed 25 Oct 2015.

NSW Resources & Energy (2015a) *Administrative Levy for the Minerals and Petroleum Industries*. NSW Government Department of Industry, Resources & Energy. <http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/applications-and-approvals/titles-application-forms/mining-act-fees/fees/administrative-levy>. Accessed 25 Oct 2015.

NSW Resources & Energy (2015b) *Derelict mines program*. NSW Government Department of Industry, Resources & Energy. <http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/programs-and-initiatives/derelict>. Accessed 25 Oct 2015.

NSW Trade & Investment (2012) *Rehabilitation Security Deposits*. NSW Government Department of Trade & Investment, Resources & Energy. Publication EDP11 2012.

NT Mines and Energy (2015) *Legacy mines* Northern Territory Government.

[http://www.nt.gov.au/d/Minerals\\_Energy/?header=Legacy%20Mines](http://www.nt.gov.au/d/Minerals_Energy/?header=Legacy%20Mines). Last updated 11/09/2015, accessed 25 Oct 2015.

OceanaGold (2015). *Bonds: before you start, think of the finish*. OceanaGold – Waihi Operation website.

Accessed 5 November 2015. <http://www.waihigold.co.nz/environment/rehabilitation/bonds/>

Parkinson (2014). *A dose of reality for Australian energy cost estimates*. Giles Parkinson. RenewEconomy website. 9 January 2014. <http://reneweconomy.com.au/2014/a-dose-of-reality-for-australian-energy-cost-estimates-94767>

Pepper, M, Roche, C P and Mudd, G M (2014). Mining Legacies – Understanding Life-of-Mine Across Time and Space, in Proceedings Second Australian Conference on Life of Mine 2014, pp 449–465 (The Australasian Institute of Mining and Metallurgy: Brisbane).

QAO (2013) *Environmental regulation of the resources and waste industries*. Report 15: 2013-14. Queensland Audit Office. 2013.

Sassoon (2008). Guidance notes for the implementation of financial surety for mine closure. World Bank. 2008.

State of Nevada (2015) Regulations: Chapter 519A - Reclamation of land subject to mining operations or exploration projects. Legislative Counsel. *State of Nevada*. <http://www.leg.state.nv.us/NAC/NAC-519A.html#NAC519ASec350>. NAC-519A Revised Date: 7-13, Accessed 5 Nov 2015.

The Western Australian (2015a). *Bit-by-bit sale for Ellendale*. The Western Australian. 3 Sep 2015.

<https://au.news.yahoo.com/thewest/wa/a/29421922/bit-by-bit-sale-for-ellendale/> Accessed 16 Oct 2015.

The Western Australian (2015b). *Precious little left to salvage from Ellendale diamond mine*. The Western Australian. 12 Jul 2015.

<https://au.news.yahoo.com/thewest/wa/a/28767060/precious-little-left-to-salvage-from-ellendale-diamond-mine/> Accessed 5 Nov 2015.

The Western Australian (2015c). *Liquidators try to dump mine*. The Western Australian. 21 Oct 2015.

<https://au.news.yahoo.com/thewest/wa/a/29861758/liquidators-try-to-dump-mine/> Accessed 5 Nov 2015.

Unger, C, Lechner, A M, Glenn, V, Edraki, M and Mulligan, D R (2012). Mapping and prioritising rehabilitation of abandoned mines in Australia, in Proceedings Life-of-Mine 2012, pp 259–265 (The Australasian Institute of Mining and Metallurgy: Melbourne).

Victorian Government (2008). Mining Warden Yallourn Mine Batter Failure Inquiry: Government Response. Victorian Government. Victorian Government Printer No 158 Session 2006–08.

Victorian Government (2013). *Inquiry into greenfields mineral exploration and project development in Victoria – Government Response*. Victorian Government. <http://www.parliament.vic.gov.au/57th-parliament/edic/article/1391>.

Victorian Government (2014). Stockman Base Metals Project. Assessment under *Environment Effects Act 1978*. Minister for Planning, October 2014

Victorian Government (2015). Hazelwood Coal Mine Fire Inquiry. Submission from the Victorian Government. Latrobe Valley Coal Mines Rehabilitation. August 2015.

World Bank (2008). *Guidance Notes for the Implementation of Financial Surety for Mine Closure*. The World Bank Group Oil, Gas and Mining Policy Division.

## Personal communications

K. Brown - Katherine Brown, Environmental Policy and Planning, Department of Environment and Heritage Protection, Queensland, 21 October 2015.

C. Liske - Chief Mining Engineer, Government of Manitoba, Manitoba Mineral Resources Mines Branch 20 October 2015.

G. Marshall - Greg Marshall, Director Mining Regulation, Department of State Development, 27 October 2015.

A. Paul - Alison Paul, Corp Affairs & Legal Manager, OceanaGold, New Zealand, 22 October 2015.

T. Ward - Tony Ward, Manager EARF and Mine Completion, Department of State Development, 29 October 2015.