Unconventional Gas: Managing Risks and Impacts

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Unconventional Gas: Managing Risks and Impacts

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VAGO
Victorian Auditor-General's Office
Auditing in the Public Interest

The Hon. Bruce Atkinson MLC
President
Legislative Council
Parliament House
Melbourne

The Hon. Telmo Languiller MP
Speaker
Legislative Assembly
Parliament House
Melbourne

Dear Presiding Officers

Under the provisions of section 16AB of the *Audit Act 1994*, I transmit my report on the audit *Unconventional Gas: Managing Risks and Impacts*.

The audit examined whether Victoria is well placed to effectively respond to the potential environmental and community risks and impacts of onshore unconventional gas activities in the event that these proceed in this state.

I concluded that Victoria is not as well placed as it could be to respond to the risks and impacts that could arise if the moratorium is lifted allowing unconventional gas activities to proceed in this state. I found that the Department of Economic Development, Jobs, Transport & Resources (DEDJTR) did not sufficiently assess the risks or regulation of these activities prior to 2012, although it has made progress in this since then.

The infancy of the industry and the moratorium provide an ideal opportunity for the government to evaluate the full range of potential issues, risks and impacts of unconventional gas. There is key work that DEDJTR needs to do to inform the government about risks and improve the regulatory system in general. It will also need to better regulate unconventional gas development, should the government allow it to proceed. The Department of Environment, Land, Water and Planning will need to support the water and planning aspects of this work.

Yours faithfully

John Doyle MBA FCPA
Auditor-General

19 August 2015

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We do not yet know the extent and commercial feasibility of Victoria's unconventional gas resources. The economic and energy supply reasons for developing an unconventional gas industry here are not clear either.

There is an ongoing dialogue in the community about our energy resources and sustainable development. Sustainability is not just about ensuring continued supply of essential resources or economic benefits. Environmental and social values are integral to this conversation, although often harder to quantify, but essential if we are to avoid a damaging legacy in years to come.

What we do know is that there are significant challenges in developing a sustainable unconventional gas industry. These include potential social and land-use impacts and conflicts resulting from Victoria's relatively small land mass, dense population, scarce water resources and high reliance on agriculture, as well as the need to respond to climate change.

Substantial national and international studies have comprehensively identified the potential and known risks unconventional gas poses to the environment and the community. The Department of Economic Development, Jobs, Transport & Resources (DEDJTR) has not identified the full range of risks, nor comprehensively assessed the likelihood and consequences of these risks in Victoria, should an unconventional gas industry develop. Since 2014 it has made good progress in identifying and assessing the key risks to water resources, in partnership with the Department of Environment, Land, Water and Planning (DELWP), and in identifying community concerns.

Information on risks is needed to properly inform decisions about the economic, environmental and social sustainability of any future unconventional gas industry.

There are major problems with applying the current regime for regulating earth resources to unconventional gas activities, which DEDJTR has used to regulate those activities to date. DEDJTR's response to regulating unconventional gas has been largely reactive, particularly before 2012, and characterised by the absence of many ingredients essential for better practice regulation.

As a result, the regime has too few environmental controls, weak consideration of the competing interests for the land involved and potential social impacts, a lack of early community engagement and too much ministerial discretion. The profusion and complexity of the regulatory system—which spans 58 Acts plus a host of regulations, codes of practice, guidelines and the like—severely compromise its transparency, clarity, efficiency and effectiveness.

Crucially, there are also no existing land-use planning or impact assessment mechanisms that adequately consider social, environmental and economic values and impacts when determining if, where and when unconventional gas activities should occur—and before licences are granted.

The intent of this audit is to apprise policy makers so they can make decisions that balance economic benefits with environmental and social impacts, and give due regard to the strengths and weaknesses of our current regulatory regime. It presents objective findings and recommendations to inform the final decision of government so that it can be made in the best interests of the Victorian community rather than individual stakeholders.

I have today written to the Honourable David Davis MP, Chair of the Parliamentary Inquiry into Unconventional Gas in Victoria, informing him that I have tabled my report. I am pleased that the committee's terms of reference will have regard to my report. My recommendations are based on extensive and rigorous information collection and analysis and I believe the committee would be well served to use them to inform both its deliberations and its final report. I look forward to discussing the report, its findings and recommendations with the committee.

I would like to thank the staff of DEDJTR and DELWP for their assistance and cooperation throughout this audit.

John Doyle MBA FCPA
Auditor-General

August 2015

Audit summary

Unconventional gas refers to a source of natural gas found in different rock layers in the earth's crust. It is more difficult to extract than conventional gas and requires different combinations of techniques such as drilling and hydraulic fracturing or 'fracking'. The three types of unconventional gas are coal seam gas (CSG), tight gas and shale gas. In Victoria CSG is regulated under the *Mineral Resources (Sustainable Development) Act 1990* (Minerals Act), and tight and shale gas are regulated under *Petroleum Act 1998* (Petroleum Act).

In 2012, a government moratorium put CSG exploration and development on hold in Victoria, ahead of national reforms for regulating CSG and the outcomes of scientific studies and community consultation. Until then there was only a fledgling unconventional gas industry as no commercial unconventional gas reserves had been found.

The Department of Economic Development, Jobs, Transport & Resources (DEDJTR) administers the Minerals Act and the Petroleum Act for the Minister for Energy and Resources. The objectives of these acts include minimising any adverse environmental and community impacts. The Department of Environment, Land, Water and Environment (DELWP) also has responsibilities for managing unconventional gas, linked to water resource and crown land management and land-use planning.

This audit examined whether Victoria is well placed to effectively respond to the potential environmental and community risks and impacts of onshore unconventional gas activities in the event that these proceed in this state.

We reviewed the activities and approaches DEDJTR and DELWP have used since 2000 to understand and manage these risks and impacts. We also reviewed national and international literature and spoke to experts in the field to ascertain the current knowledge about these matters and to identify better practice.

Conclusions

Victoria is not as well placed as it could be to respond to the environmental and community risks and impacts that could arise if the moratorium is lifted allowing unconventional gas activities to proceed in this state. DEDJTR did little to assess the risks and or plan how it could strengthen the regulation of these activities prior to 2012, despite growing public concerns about the potential risks. DEDJTR initially assumed that exploration for unconventional gas could be managed using the existing regulatory framework with minor amendments and therefore only minimal changes to licence conditions, regulations, codes and guidance materials were warranted.

DEDJTR has made progress since 2012 to better understand the risks to water resources, the community concerns and the strengths and weaknesses of the current regulatory system, but there are still gaps in its approach.

Experience here, and in other jurisdictions indicates that even if a commercial discovery was made soon after the moratorium was lifted, it would take at least five years to reach commercial production. The infancy of the industry and the current moratorium provide an ideal opportunity for the government to evaluate the full range of issues, risks and impacts of unconventional gas. This puts the state in a fortunate position of having time to more fully comprehend the risks and impacts of this new industry in Victoria. This will enable the government to adjust its policy and regulatory settings as necessary. There is time, should government decide to allow unconventional gas activities to proceed, to:

- improve our scientific knowledge of both the above and below ground characteristics of prospective sites and the potential and known risks to water, air, and land
- improve our consideration and assessment of the social impacts of this industry
- reform the current planning and regulatory systems to enable them to better deal with the region-wide and cumulative social and environmental impacts of this industry
- address deficiencies in community engagement, the transparency of decision-making and the oversight of the industry's environmental performance.

Unconventional gas exploration to date

The extent, location and commercial feasibility of unconventional gas resources in Victoria is not completely unknown, but is untested. In Victoria the responsibility for locating and testing gas resources currently lies with the industry.

Victoria has a relatively small land mass, a high population and heavy economic dependence upon the agricultural sector in regional areas. There is also a high level of concern about unconventional gas impacts in some sectors of the community. Coupled with the proximity of large gas fields offshore, the cost of commercial production, fluctuating energy markets, the need to deal with climate change issues and the growth of renewable energy sources, there are significant challenges to the development of an unconventional gas industry in Victoria.

Interest in the possibility of unconventional gas in Victoria started in the early 2000s. Between 2000 and 2014, at least 100 licences allowed unconventional gas activities. This has provided some information about potential resources, but commercially viable discoveries have yet to been made. In other states and territories, such as Queensland, CSG has been in commercial production since 1996 and is now supplying both domestic and international markets.

In August 2012, the previous Victorian government introduced a moratorium on new onshore CSG exploration licences and all hydraulic fracturing activities. The government wanted to participate in the development of new standards for regulating CSG being driven by the Commonwealth and other states, to better understand the implications for Victoria. The moratorium was expanded in late 2013 to include all onshore gas exploration while water resource studies and focused community consultation were being undertaken. In January 2015 the current government announced a Parliamentary Inquiry into unconventional gas with a final report planned to be presented by December 2015.

Findings

Following the emergence of an unconventional gas industry in Victoria in the early 2000s, the government through its relevant agencies—currently DEDJTR—focused its attention on encouraging industry development. It did not adequately consider or assess the risks associated with unconventional gas exploration and production.

The scientific literature is clear that the development of different sources of unconventional gas poses a range of risks, both above and below ground. These relate to water and the environment, and community health and amenity. Potential impacts include:

- competition for groundwater
- groundwater, soil and air contamination
- habitat fragmentation
- impacts on landscape values
- noise and dust
- impacts on human health.

Scientific literature and reviews have concluded that risks can be managed if there is:

- comprehensive baseline data and monitoring
- appropriate siting based on sustainability principles
- implementation of best practice construction and operation standards, including well design and management
- implementation of best practice risk mitigation controls
- a strong regulatory framework
- early and risk based community engagement.

No jurisdiction has adequately addressed all these principles to date.

Understanding unconventional gas risks

DEDJTR has not comprehensively assessed the likelihood and consequences of the risks associated with unconventional gas activities in Victoria. As a result, there are significant gaps in scientific information that need to be filled to understand the likelihood, scale and consequences of the risks associated with this industry.

This is because DEDJTR regarded unconventional gas as an industry that could be managed using the existing regulatory system in the decade following the industry's emergence in the early 2000s. DEDJTR considered commercial production of coal, gold and mineral sands required a higher priority risk management focus based on the limited number and type of unconventional gas exploration activities underway. In contrast, as unconventional gas had not progressed to commercial production it assumed that the existing regulatory system would suffice. This was despite having identified, from around 2000, that as a new and growing industry CSG exploration needed new regulatory approaches. Consequently, DEDJTR's identification of risks over this period was slow, informal and ad hoc.

From 2010 the risks and impacts other jurisdictions were having to deal with became clearer to DEDJTR. There was also increasingly vocal community concern about impacts of an unconventional gas industry given the experiences in Queensland with CSG. DEDJTR was slow to engage with the community on these issues.

DEDJTR's approach to identifying and assessing risks improved from 2012. This was driven by Victoria's commitment to Commonwealth initiatives on CSG, as well as the government's focus on understanding community concerns and identifying water resource risks.

Based on what is known to date, the areas most likely to contain an unconventional gas resource are the Gippsland and Otway basins. If this is the case, as well as potentially providing new opportunities, any new industry may come into conflict with other land uses, particularly as these basins contain highly productive agricultural land. Greater possibilities appear to exist for tight and shale gas than CSG, which would make some of the risks and considerations, and even the footprint on the landscape, different from the experiences in Queensland and New South Wales. Without better information and scientific knowledge about these basins, government is limited in its ability to make informed decisions about the feasibility and sustainability of an unconventional gas industry in Victoria.

Reforms are needed to address the distinct challenges associated with developing unconventional gas resources. Key challenges include managing:

- the potential impact of these activities over large areas both above and below ground
- the cumulative impacts over time and those associated with a greater concentration of infrastructure
- the coexistence and conflict with existing and potential other resource uses such as agriculture, tourism and urban development.

Regulating unconventional gas activities

The current regulatory system will not be able to effectively manage unconventional gas risks. The system is complex and fragmented, making it difficult for DEDJTR to effectively implement and administer. This also creates difficulties for licensees as they navigate their way through the system. To complicate things further, DEDJTR, DELWP and other regulators responsible for administering the system have overlapping roles and responsibilities. Together these issues severely impact on the system's transparency, clarity and efficiency.

Victoria's regulatory system does not currently contain clear and transparent requirements for the mandatory risk-based impact assessment of unconventional gas activities. There are referral triggers for CSG applications under both the *Environment Effects Act 1978* (EE Act) and the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*, but these are outlined in non-binding guidelines. There are no similar triggers for tight and shale gas. The decision as to whether an environmental impact assessment is required under the EE Act is at the discretion of the Minister for Planning. Guidelines informing this discretion should be reframed to clarify and consolidate the decision criteria currently split between the 2012 amendment to the Ministerial Guidelines and the Victorian Protocol under the *National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development*.

The Minerals Act allows for an impact assessment to be required prior to commercial production but only at the Minister for Energy and Resources' discretion. This provision has never been used. The Petroleum Act has more general environmental assessment provisions for all stages of resource development, however, these are also at the Minister for Energy and Resources' discretion.

Other jurisdictions and industries have described the technical and operational best practices needed to effectively manage the scale of risks posed by unconventional gas activities. This is done through a range of codes of practice that provide industry with certainty about what it needs to do to manage risks, and the public with an understanding of how the risks will be managed. These jurisdictions also require approved technical experts to independently review and oversee key elements of the regulatory system.

Victoria does not have a comprehensive code of practice or set of codes to manage the range and scale of risks posed by unconventional gas activities. Nor does the regulatory system require an independent review of how risks are assessed, managed and monitored as is the case with other activities in Victoria, such as landfills and contaminated sites.

We identified weaknesses in DEDJTR's approach to administering the system, particularly with its work plan approval and compliance activities. Its licences and work plan approvals do not sufficiently address risks or monitoring requirements. Its compliance activities are poorly informed and planned, and not always executed effectively. There were examples where—despite identifying poor licensee practices—action was not taken to review or change its approach, or to reconsider whether existing controls were adequate.

DEDJTR has started work to address some of these issues. It has assessed the regulatory system against the Commonwealth's standards for CSG and benchmarked its performance as a regulator against other jurisdictions. DEDJTR will need to develop a much more reflective, adaptive and systematic approach to its activities to achieve better practice in unconventional gas regulation and management and to effectively minimise environmental risks.

The way forward

Our review of the Victorian regulatory system, past unconventional gas activities and literature on managing unconventional gas, has identified key steps needed to provide a sustainable foundation for an unconventional gas industry, should this activity be allowed to proceed. These steps should provide greater certainty and security for industry and improve community participation and understanding of these activities and of the basis for government decisions.

Natural resources need to be managed sustainably. Competing interests need to be assessed equitably based on reliable data and an understanding of the environmental, social and economic risks, and benefits of each resource to both the local community and the state as a whole.

The starting point is to improve the way earth resources—which have been pre-competitively identified at a regional scale—are identified and assessed as an appropriate land and resource use in terms of sustainability. DEDJTR firstly needs to improve its identification of areas that offer the highest potential for the occurrence of unconventional gas through an improved resource assessment process. Once a region has been identified as potentially containing unconventional gas through such an assessment, DELWP should facilitate the development of a land-use plan for any area before it is approved for unconventional gas development. Land-use plans are useful tools to define where certain uses and/or activities can take place sustainably and to determine their impacts on the landscape. Their purpose is to select land uses that will best meet the needs of the Victorian community while safeguarding natural resources for the future.

Currently decisions about approving areas for development are made without a comprehensive resource assessment and land-use planning exercise.

For areas identified as sustainable, DEDJTR should develop guidelines in coordination with DELWP and other natural resource managers that identify the key landscape, environmental and social factors and considerations that need to be taken into account and assessed as part of any proposal to develop an earth resource in that area. This can be done using existing land, natural resource and water and groundwater information held by DELWP and the information that will be generated from the Victorian water studies and the Commonwealth's bioregional assessments.

DEDJTR would then be able to provide prospective licensees with improved information around the potential for unconventional gas in an area and the key economic, environmental and social considerations that would form part of an assessment and approval process.

This detail should form a part of the information package accompanying areas released for exploration. This will improve the transparency around the key issues and risks and the level of impact assessment required for specific areas. Currently this is only done for petroleum exploration areas, and with only limited information about the potential resource. It does not include economic, environmental and social considerations. The type and level of a mandated, risk-based impact assessment should be tailored around these guidelines.

A further, critical part of the reform process is improving landowner and community participation. Communities need to be engaged early and the level and type of engagement through the life cycle of a proposal should be tailored to the risk. Communities should be able to contribute to and influence decision-making in relation to the identification of sustainable earth resource development areas. Once determined, community consultation and engagement should be focused on information sharing in relation to how risks are to be managed and the performance of a company over the tenure of an operation.

The current access and compensation arrangements for landowners are often criticised for not being fair or just. There is an imbalance between the bargaining positions of landowners and industry, and the legislation unfairly limits possible compensation to those directly affected.

Existing community involvement is largely determined by whether activities are conducted under an exploration or commercial production licence and does not reflect the degree of risk to the community created by these activities. Options such as the Royalties for Regions schemes that operate in Western Australia and Queensland should be considered for Victoria. These strategies recognise the value of compensating local communities who may be impacted by an unconventional gas industry by redistributing some of profits back into the community.

Community and regulator confidence can also be improved through the independent oversight of the industry’s environmental performance and improved transparency in decision-making and performance reporting.

The recommendations in this report focus specifically on informing the management of future unconventional gas activities should the moratorium be lifted and the government decide to support that industry. However, many of them also have broader application. For example, they may also benefit the management of onshore conventional gas activities as well as other earth resources activities more generally. For this reason, we also ask DEDJTR to consider the benefits of applying these recommendations to its earth resources responsibilities more broadly.

Recommendations

Number	Recommendation	Page
To inform the government's review of the moratorium and subsequent decision about whether or not an unconventional gas industry should proceed in Victoria		
That the Department of Economic Development, Jobs, Transport & Resources, in partnership with the Department of Environment, Land, Water and Planning:		
1.	develops a risk-based strategy which: • identifies known and potential risks to water, air, land and the community associated with the development of an unconventional gas resource using available information and data and the input of relevant agencies as needed • prioritises the actions that would need to be taken for an unconventional gas industry to proceed and identifies roles and responsibilities for these.	29
Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed		
That the Department of Economic Development, Jobs, Transport & Resources:		
2.	coordinates an interdisciplinary process with representatives from government departments, scientific organisations and industry to: • identify the baseline data needed—geological, hydrological, environmental and social—to be collected through regional studies at a level of resolution and accuracy that will enable future risks and potential impacts to be clearly identified and assessed • identify opportunities to fund this work.	30

Recommendations – *continued*

Number	Recommendation	Page
Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed – *continued*		
That the Department of Economic Development, Jobs, Transport & Resources:		
6.	progresses reforms of Victoria's regulatory system to underpin sustainable unconventional gas activities, specifically focusing on: • fully implementing the *National Harmonised Regulatory Framework for Natural Gas from Coal Seams'* 18 leading practices for coal seam gas, and for other types of unconventional gas, where relevant and appropriate • reviewing the licence conditions and requirements of work and operations plans to align with the leading practices in the *National Harmonised Regulatory Framework for Natural Gas from Coal Seams* and any other better practices identified through regulatory reform • working with the Department of Environment, Land, Water and Planning, to address the gaps, inadequacies and unclear roles and responsibilities within the regulatory system, to better manage the impacts and challenges related to water resources	50
7.	in consultation with stakeholders, develops an industry-wide code of practice for the exploration, production, and impact management of unconventional gas activities that specifically includes requirements for best practice in: • information disclosure • well integrity • hydraulic fracturing activities • produced water • fugitive emissions • well decommissioning and rehabilitation obligations • baseline and ongoing monitoring • performance assurance	50
8.	improves the amount of detail included in the pre-competitive information packages accompanying any release of land for exploration through a more comprehensive resource assessment process	64
9.	reviews the land access and compensation provisions of the regulatory system in line with best practice requirements from other jurisdictions	64
10.	develops options for consideration by the Minister for Energy and Resources regarding the feasibility of models to compensate impacted communities, such as the Royalties for Regions schemes in Western Australia and Queensland	64
11.	reviews community consultation requirements in the regulatory system to ensure they address the spectrum of social risks and impacts across the lifecycle of resource development rather than being aligned to the licensing and approval stages	64
12.	reviews best practice proactive information disclosure requirements for inclusion in the regulatory system.	64

Recommendations – *continued*

Number	Recommendation	Page
Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed		
That the Department of Environment, Land, Water and Planning, in consultation with the Department of Economic Development, Jobs, Transport & Resources:		
13.	develops a land-use plan to determine the sustainability of an area for the extraction of unconventional gas prior to any licence being issued	64
14.	reviews models to implement a mandated impact assessment process under the *Environment Effects Act 1978* and the relevant earth resources Act/s.	64
To improve the regulation of all earth resources, regardless of whether or not the moratorium is lifted and unconventional gas exploration and development allowed to proceed		
That the Department of Economic Development, Jobs, Transport & Resources:		
3.	strengthens and clarifies the regulatory system to better manage all earth resources, giving consideration to: • consolidating the earth resources Acts into a new single, integrated earth resources management Act that is risk based and addresses environmental, economic and social priorities in decision-making • securing qualified, objective and independent environmental regulation capability and oversight for the licensing and environmental performance of earth resource industries through reviewing models from other jurisdictions • implementing a mandatory risk-based environmental impact assessment process • developing an approvals system that is risk based in proportion to the activities proposed, using risk-based work plans as one of the elements • requiring risk-based environmental management plans for all stages, from exploration to decommissioning and aftercare • requiring licensees to seek third party oversight and auditing for key elements of their environmental performance	49
4.	improves its earth resources compliance approach, by addressing the recommendations of VAGO's 2012 audit *Effectiveness of Compliance Activities: Departments of Primary Industries and Sustainability and Environment*	49
5.	introduces a reflective, adaptive and systematic approach to the way it administers the regulatory system to enable it to respond appropriately to new earth resources activities and emerging risks, including improved processes to: • identify and monitor emerging issues • consistently and comprehensively assess licences, work and operations plans • consider the available evidence and clearly document the rationale of decisions.	49

Submissions and comments received

We have professionally engaged with the Department of Economic Development, Jobs, Transport & Resources and the Department of Environment, Land, Water and Planning throughout the course of the audit. In accordance with section 16(3) of the *Audit Act 1994* we provided a copy of this report to those agencies and requested their submissions or comments.

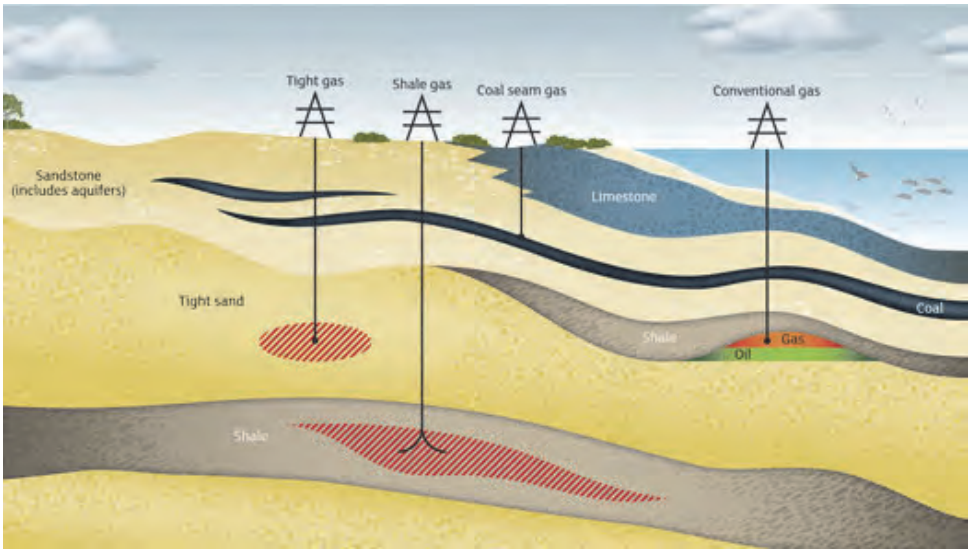
We have considered those views in reaching our audit conclusions and have represented them to the extent relevant and warranted. Their full section 16(3) submissions and comments are included in Appendix D.

1 Background

1.1 What is unconventional gas?

Unconventional gas refers to an underground source of natural gas found in certain rock layers. Natural gas is primarily composed of methane and is used as an energy source. There are four types of rock structures that can be sources of natural gas; 'conventional' rock sources and three 'unconventional' sources—coal seams, tight rocks and shale rocks. The different sources of gas and their relative depths are shown in Figure 1A. Conventional and unconventional sources can be co-located within rock structures.

Figure 1A
The location of unconventional gas types in the earth's layers.



Source: Department of Economic Development, Jobs, Transport & Resources.

Conventional gas is generally easier to access and extract than unconventional gas. With the former a well is drilled directly into gas trapped within porous rocks. Once tapped the gas flows readily. Coal seam gas (CSG) is trapped within the gaps and cracks of the coal seam by water pressure, so water must be extracted for the gas to be released. Shale and tight gas are located in the pores of dense rock and these rocks almost always need to be fractured to release the gas. This is usually done by hydraulic fracturing, which involves pumping water, chemicals and sand into a gas well under high pressure to fracture the rock and release the gas.

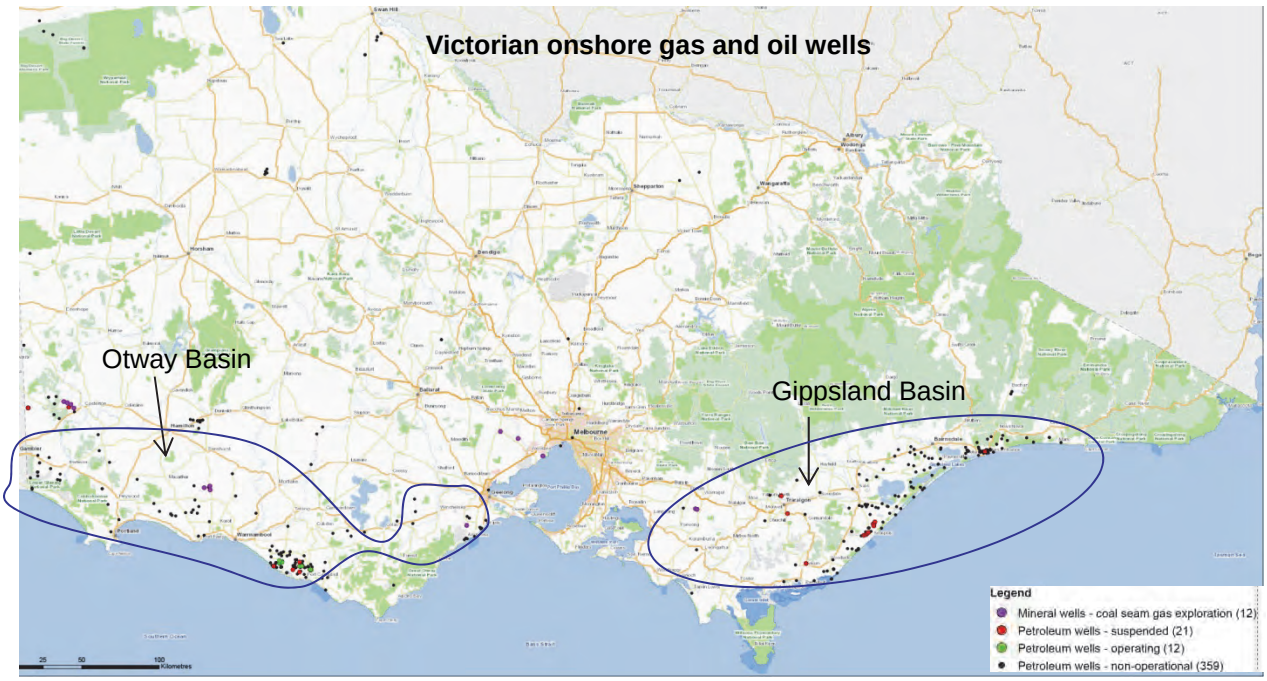
The commercial production of unconventional gas has historically been uneconomical due to the difficulties in extraction. Advances in horizontal drilling technology since the late 1980s have increased access to areas where unconventional deposits are located. This drilling method, combined with hydraulic fracturing, has increased the productivity of unconventional wells. Along with oil and gas pricing trends, these factors have enabled commercial production to emerge around the world.

1.2 Context for the development of unconventional gas in Victoria

In Victoria, there has been exploration for both onshore coal seam and tight gas but no production, and onshore natural gas has only been produced commercially from conventional sources.

The likelihood that unconventional gas could be commercially extracted in Victoria and be competitive with the other states is still untested. In particular, there is uncertainty about the potential for Victoria's large coal deposits to produce CSG. These deposits are brown coal, which is shallower, softer and has lower gas content than the black coal deposits that are producing CSG in Queensland and New South Wales (NSW). CSG has not yet been produced commercially from brown coal anywhere in the world.

The exact location and extent of Victoria's unconventional gas resources is untested. Onshore exploration has identified that the Gippsland and Otway basins have the largest potential onshore unconventional gas reserves, as seen in the following map.

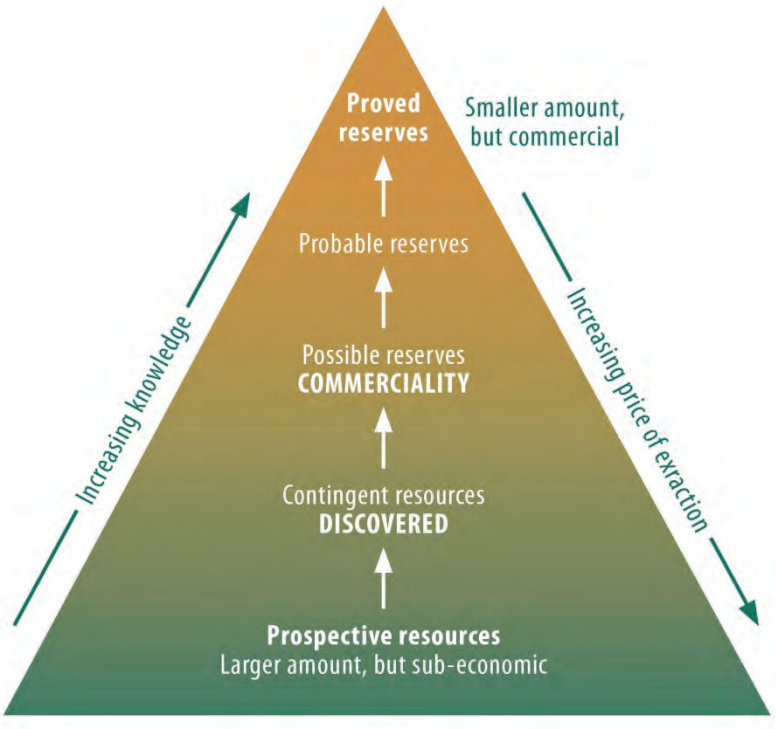


Notes: The mineral wells do not include commercially sensitive sites.
The operating wells either produce co_2 or store natural gas as part of the eastern Australian gas supply.
The non-operational wells date back as early as the 1920s and include oil wells.

Conventional onshore gas exploration in Victoria dates back to the 1950s. Although unconventional gas exploration was first contemplated in the 1980s it took until the early 2000s before exploration began. Since then it has been limited in both geographical spread and the range of exploratory activities conducted.

The Society of Petroleum Engineers identifies three classes of petroleum resources according to their potential for commercial production. Prospective resources have a large uncertainty about them. Once gas has been discovered the resource is described as contingent and only proved reserves are considered ready for commercial production, as shown in Figure 1B. Victoria's resource status has not progressed beyond the contingent stage.

Figure 1B
Stages of discovery for petroleum resources



Source: Australian Council of Learned Academies, *Engineering energy: unconventional gas production: a study of shale gas in Australia*, final report 2013.

The need and desire for an unconventional gas industry in Victoria are likely to be influenced by a range of factors, including:

- the cost of producing the resource
- domestic and international energy demand and pricing
- climate change and the growth of renewable energy sources
- economic development in regional areas
- compatibility with sustainable natural resource use and existing land uses
- community attitudes.

1.2.1 Global and domestic energy needs and production

Global energy demands are increasing. The International Energy Agency's 2014 *Energy Supply Security: The emergency response of IEA countries* report indicated that natural gas is increasingly important in the global energy mix, growing from 16 per cent to over 21 per cent of total primary energy supply since 1974 and still rising at over 2 per cent a year.

Globally, natural gas is regarded as a superior source of electricity for a number of reasons. Technically and financially, it is a lower-risk resource and gas plants can be constructed quickly relative to other energy facilities.

A growing population, combined with increased energy demands and climate change imperatives, have contributed to the surge in interest for new sources of natural gas worldwide, and in unconventional gas as the main untapped resource. Within an increasingly carbon-focused global economy—where greenhouse gas emissions generate costs—natural gas has been characterised as a transition resource towards reliance on renewable energy sources. This is because it produces less greenhouse gas emissions when burnt than coal and oil.

Australian gas production

Victoria, NSW, Queensland, South Australia and Tasmania are all connected by gas pipelines and form the eastern Australian gas market.

The eastern gas market has traditionally provided gas for domestic use only. The development of liquefied natural gas (LNG) facilities in Queensland is changing this. Many industry assessments predict that gas exports from Queensland will increase the domestic gas price in the eastern market from the current relatively low price to reach parity with increasing international prices.

Several industry reviews and the Australian Government's 2015 *Energy White Paper* argue that one of the best ways to tackle rising gas prices will be to increase the supply of gas by promoting onshore unconventional gas production.

CSG has been commercially produced in Queensland since 1996 and in NSW since 2001 but the development of shale and tight gas resources is still in its infancy. Minor shale gas production commenced in South Australia in 2012 but tight gas is yet to be commercially produced in Australia.

The vast majority of CSG is being produced in Queensland, with a small amount produced in NSW. The Productivity Commission's 2015 report on *Examining Barriers to More Efficient Gas Markets* identified that the proven and probable gas resources in the Surat Basin and Bowen Basin in Queensland have grown roughly tenfold since the 1980s. Figure 1C shows that Western Australia, the Northern Territory and South Australia all have larger probable resources, but the commercial potential of these has not been proven, while Victoria and Tasmania have far less unconventional gas potential.

Figure 1C
State comparison of onshore unconventional gas potential[(a)] and drilling activity (number of wells), 2013

State or territory	Production	Proved reserves	Contingent resources	Prospective resources	Wells drilled
Queensland	264	41 124	Not available	164 000	1 000
NSW	3	284 to 3 919	527 to 3 757	14 401	10
Western Australia	none	none	3 275 to 5 898	427 000	15[(b)]
South Australia	none	none	1 725 to 6 807	45 000 to 268 000	13
Northern Territory	none	none	none	257 276	10
Victoria	none	none	403 to 1 212	452	none
Tasmania	none	none	none	none	none

(a) Gas potential specified in peta joules.

(b) Data were not available for 2013 alone for Western Australia—the 15 wells were drilled between 2005 and 2013.

Note: Where available, the range in the estimates of resources/reserves has been included.

Source: Victorian Auditor-General's Office from the Upstream Petroleum and Resources Working Group Report to the Council of Australian Governments' Energy Council, *Unconventional Reserves, Resources, Production, Forecasts and Drilling Rates*, 2014.

Most gas extracted in Victoria to date has come from conventional gas fields in Bass Strait where over 80 per cent of Victoria's offshore gas reserves are located. The Department of Economic Development, Jobs, Transport & Resources (DEDJTR) has calculated that production from the offshore gas fields in Victoria is worth approximately $1.5 billion annually.

1.2.2 Status of the industry in Victoria

The onshore unconventional gas industry in Victoria has not progressed significantly. This is largely because of the size and proximity of the offshore reserves in Bass Strait and off the coast at the west of the state, and uncertainty about how much onshore gas Victoria has compared to the known reserves in Queensland and NSW. The previous government also put a moratorium on new onshore CSG exploration in 2012, which the industry considered to be a disincentive to investment in onshore gas exploration. Appendix A presents a time line of unconventional gas events in Victoria and nationally since 2009.

Between 2000 and 2014, at least 100 licences were active that allowed unconventional gas exploration or production:

- **CSG**—the 60 licences that allowed CSG exploration were granted between 2000 and 2012, including 33 for the Gippsland Basin and 17 for the Otway Basin.
- **Tight and shale gas**—the 40 licences that allowed tight and shale gas exploration were granted between 1999 and 2013, including nine for the Gippsland Basin and 29 for the Otway Basin.

At least 73 wells were drilled on around 26 licences, although some of these targeted conventional gas. Figure 1D summarises these activities and illustrates the industry's slow development.

Figure 1D
Summary of unconventional gas exploration in Victoria

Exploration for CSG and tight gas has occurred in both the Gippsland and Otway basins. Since 2000, only one unconventional gas exploration licence has confirmed the discovery of a potential gas reserve and progressed to the next exploration stage, which is called retention. This was for tight gas, near Seaspray in the Gippsland Basin. Key events over this period were:

- 2001—first approval of hydraulic fracturing for CSG in the Gippsland Basin
- 2004—first approval of hydraulic fracturing for tight gas in the Gippsland Basin
- 2007—most recent approval to drill and frack a CSG well in the Gippsland Basin
- 2009—most recent approval for fracking for tight gas in the Gippsland Basin
- 2013—first application for onshore horizontal drilling, now on hold due to the moratorium.

The CSG wells were drilled and fracked at depths between 600 and 1 500 metres. CSG wells were fracked 12 times between 2007 and 2008.

The tight gas wells were drilled to depths between 1 000 and 3 600 metres, with hydraulic fracturing at around 2 500 metres. There were 11 hydraulic fracturing operations in tight gas wells between 2004 and 2009.

The groundwater aquifers that currently provide water to farmers, industry and towns in the Gippsland Basin near Sale extend from close to the surface to around 1 300 metres below. This means the coal seams in the basin are located within the deeper aquifers, and the tight and shale gas rocks sit below the aquifers. In the Otway Basin near Warrnambool the aquifers occur from close to the surface to around 900 metres below and are largely above the coal seams in the basin, and above the tight and shale gas rock layers.

While some licensed exploration areas are very large, the total size of the drilled sites on any licence to date has been significantly smaller. For example, the onshore Gippsland Basin is 7 700 square kilometres and hosts the largest unconventional gas licence, at 3 800 square kilometres. In comparison, drilling activities have occupied less than 3 square kilometres of the licensed area.

Source: Victorian Auditor-General's Office.

1.2.3 The Victorian moratorium

In August 2012, the previous Victorian Government introduced a moratorium that placed a hold on approving new onshore CSG exploration licences and all hydraulic fracturing activities. This was done to halt activities while the government awaited the development of a regulatory framework for CSG by the states and Commonwealth. It followed the signing of the *National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development* in June 2012. The government also committed to improving the consideration of land-use issues in approval processes by strengthening policy and legislation. In late 2013, the moratorium was expanded to halt all new onshore gas exploration approvals—for conventional or unconventional sources—until at least July 2015.

In between these moratorium announcements the government also committed to conducting public consultation and groundwater science studies, to better understand the risks. In November 2014, legislation was enacted banning the use BTEX chemicals—known to be toxic—in exploration and production activities.

The current government extended the moratorium until risks are properly understood and protection of the ground and surface water can be ensured. In January 2015 it announced a Parliamentary Inquiry into issues surrounding unconventional gas exploration and production, which is due for completion by December 2015.

This has mirrored similar approaches in other states. All states and territories except the Australian Capital Territory have conducted a substantial inquiry or review into unconventional gas since 2011 and two other states also imposed moratoria—NSW in 2011 and Tasmania in 2014. The NSW moratorium was lifted in 2012 following the outcome of the NSW inquiry. Several other jurisdictions have imposed moratoria or banned unconventional gas and/or hydraulic fracturing activities completely, including Germany, France, Scotland and some American states.

1.2.4 Issues for consideration in Victoria

There are three core areas of potential impact of onshore unconventional gas activities in Victoria—economic gain, social and industry impact and environmental risk. Victoria has a relatively small land mass, a high population and strong economic dependence on the agricultural sector. This creates significant challenges for developing an unconventional gas industry.

A key challenge is that the most likely areas for commercial unconventional gas production underlie prime agricultural land. There is a widespread perception that these industries have fundamentally conflicting interests.

These are also areas where the sustainable use of groundwater by existing industries, towns and farms is already reaching or at the identified limit that still leaves enough groundwater to maintain dependent ecosystems. Existing and past activities have adversely affected the quality of the groundwater in many locations.

Community concern about the potential risks posed by unconventional gas activities also presents challenges. Concern has been increasing in Victoria since around 2010, when hydraulic fracturing became prominent both nationally and internationally following the release of the documentary *Gasland* and reports of potential environmental and health impacts—including from CSG production—in Queensland and NSW. At the same time, a significant body of scientific literature indicated that environmental impacts can be managed if best practice is adhered to. However this has done little to reduce community concern.

By 2010, commercial production of onshore conventional gas had been underway in Victoria for almost 20 years but had not raised similar levels of concern.

In Victoria, community concern is apparent in the number of community meetings on these issues and local councils opposing CSG or unconventional gas more broadly. For example, the State Council of the Municipal Association of Victoria resolved in May 2014 to oppose any CSG exploration or production within the state. Recently the Victorian Farmers Federation has publically stated that the ban on hydraulic fracturing should remain in place until at least 2020 while more information is gathered on the potential risks of an unconventional gas industry.

Food, water and energy security are all important. Each relies on and competes for the state's natural resources, particularly ground and surface water. The government now has the opportunity to carefully evaluate the full range of issues, risks and impacts associated with an unconventional gas industry and consider how these can be best managed so as not to jeopardise Victoria's economic, environmental and social sustainability.

1.3 The regulatory system

This audit has considered the regulatory system for unconventional gas as encompassing two aspects:

- the direct earth resources policy and legislation and all the associated tools including codes of practice, licences, permits and guidelines
- policy and legislation for managing environmental values and impacts and land-use planning more generally, such as state environment protection policies and water legislation.

1.3.1 Policy

The Australian Government's 2015 *Domestic Gas Strategy* identifies that the states are primarily responsible for regulating onshore gas resources in their jurisdictions, and it expects them to support the development of the unconventional gas industry, using strong scientific evidence to underpin any decision.

DEDJTR's 2014 *Earth Resources Statement* identified that the moratorium would extend until at least July 2015 and that government policy would continue to be informed by independent scientific facts and public consultation, and would recognise the economic importance of the agriculture sector.

The current government has not continued with the actions identified in this statement and has not released a replacement strategy. A media release stated that the Parliamentary Inquiry into unconventional gas aimed to be 'a thorough and considered inquiry into onshore gas in Victoria, based on robust scientific evidence and community engagement'.

1.3.2 Legislation

Victoria directly regulates onshore unconventional gas activities through two Acts:

- the *Mineral Resources (Sustainable Development) Act 1990* (Minerals Act) regulates CSG exploration and production
- the *Petroleum Act 1998* (Petroleum Act) regulates shale and tight gas exploration and production.

These Acts are administered by the Minister for Energy and Resources through DEDJTR, formerly the Department of State Development, Business and Innovation and before that, the Department of Primary Industries. The objectives of both Acts include minimising adverse environmental and community impacts.

There are at least 52 other acts and a vast array of associated regulations, policies and guidelines that indirectly regulate the environmental and social impacts of unconventional gas activities. These include the *Planning and Environment Act 1987*, the *Environment Effects Act 1978*, the *Environment Protection Act 1970*, the *Water Act 1989* and the *Crown Land (Reserves) Act 1978*.

1.3.3 Roles and responsibilities

There are two departments with the primary responsibilities for unconventional gas. There are also a number of agencies responsible for discrete aspects, related to the various Acts that indirectly regulate unconventional gas.

Department of Economic Development, Jobs, Transport & Resources

DEDJTR is responsible for managing the earth resources sector through the responsible and sustainable allocation and regulation of earth resources that provide financial benefits and meet the economic, social and environmental objectives of the state. This includes licensing unconventional gas exploration and production, approving plans, assessing environmental impacts as part of approval processes, and monitoring and enforcing industry adherence to regulation. It also collects royalties from mineral and petroleum production.

Department of Environment, Land, Water and Planning

The Department of Environment, Land, Water and Planning's (DELWP) main roles relating to unconventional gas are:

- advising the Minister responsible for Crown land on licence applications covering Crown land and requests for access to Crown land
- supporting the Minister for Planning in deciding whether onshore gas production applications require an environmental effects statement (EES) and administering the EES legislation and inquiry process
- developing a strategic land-use policy to better manage competing land uses in Victoria, such as mineral or petroleum production and agriculture
- in partnership with water corporations and catchment management authorities, managing Victoria's water resources, including extraction, licensing and discharge
- advising the minister responsible for water on water resources including planning and entitlements.

Other agencies

Exploration and production activities are exempt from Environment Protection Authority (EPA) approval and licensing unless they continually discharge waste waters. However, the EPA still plays a key role in advising DEDJTR on appropriate licence conditions to manage the environmental risks of mineral or petroleum production activities. It can also regulate pollution events, or events that pose a serious risk of harm to health or environment.

Rural water corporations licence surface and groundwater extraction and replacement for the commercial production of unconventional gas, associated infrastructure and disposal of matter underground.

The Victorian Mining Warden is appointed by the Governor in Council under the Minerals Act, as an independent statutory officer. The warden can investigate issues and disputes, about the existence of a licence or the boundaries of a licence or licence application, between a licensee and DEDJTR, landowners, another licensee or a member of the public.

1.4 Audit objective and scope

The audit examined whether Victoria is well placed to effectively respond to the potential environmental and community risks and impacts of onshore unconventional gas activities in the event that these proceed in this state.

The audit did not focus on onshore conventional gas activities and did not examine processes that can transform solid coal into gas.

1.5 Audit method and cost

The audit assessed previous unconventional gas activities covered by the Minerals and Petroleum Acts. This included DEDJTR's administration, application, monitoring and enforcement of the regulatory requirements for these activities and DELWP's roles relevant to water management and planning.

The audit also consulted with a range of eminent experts and reviewed national and international literature on unconventional gas to identify the issues, risks and impacts that have been identified to date. It examined other state and international policy and regulatory systems for managing and monitoring unconventional gas risks and impacts, to identify better practice.

The audit was conducted in accordance with the Australian Auditing and Assurance Standards. Pursuant to section 20(3) of the *Audit Act 1994*, unless otherwise indicated any persons named in this report are not the subject of adverse comment or opinion.

The cost of the audit was $525 000.

1.6 Structure of this report

The report has three further parts:

- Part 2 examines what is known about the potential risks and impacts from unconventional gas activities in Victoria and how these have been addressed
- Part 3 examines how effectively the existing regulatory framework has been applied to the unconventional gas exploration activities that have occurred to date
- Part 4 identifies opportunities to improve the planning that informs the release of areas for exploration and better manage the challenges posed by unconventional gas if an unconventional industry is supported in Victoria.

A glossary of uncommon terms used throughout this report is included in Appendix B.

2 What are the risks?

At a glance

Background

A comprehensive body of literature and interstate and overseas experience has illustrated the potentially significant risks and impacts of unconventional gas resource development. A risk management approach is required to assess their relevance to Victoria.

Conclusion

The Department of Economic Development, Jobs, Transport & Resources (DEDJTR) has not yet developed a comprehensive risk management approach to identifying the potential risks of unconventional gas activities in Victoria. This is due to a moratorium being put in place, the resource potential of this source of gas being unknown and the limited activity to date. However, this is a missed opportunity as there have been numerous chances for the department to collate the data and knowledge around risks, to ensure future decisions are evidence based and timely.

Findings

- The potential of unconventional gas resources in Victoria is unknown.
- The risks associated with unconventional gas activities in Victoria have not been comprehensively identified, prioritised or assessed.
- DEDJTR's approach to collating intelligence around the risks posed by unconventional gas activities in Victoria has significantly improved since 2012. Since then, DEDJTR has focused on understanding community concerns.
- The Department of Environment, Land, Water and Planning (DELWP) has focused on identifying risks to water resources.
- Knowledge gaps remain about risks to the landscape, land use, air quality and human health.

Recommendations

DEDJTR, in partnership with DELWP, develops a comprehensive risk management strategy for unconventional gas activities in Victoria.

2.1 Introduction

Overseas and interstate literature and experience has illustrated the potentially significant risks and impacts associated with an unconventional gas industry. This has made the development of unconventional gas resources extremely controversial both here in Victoria and elsewhere.

A risk management approach is required to identify and prioritise the risks relevant to Victoria, to assess their associated impacts and to identify appropriate controls to mitigate medium and high risks to an acceptable level. The development of a comprehensive risk management strategy is the first step in developing such an approach as it identifies the risks, their likelihood and their consequences.

2.2 Conclusion

The Department of Economic Development, Jobs, Transport & Resources (DEDJTR) and its predecessors have not implemented a systematic and comprehensive approach to assess all the risks associated with unconventional gas activities in Victoria. While it has identified and assessed the key risks to water resources—with the assistance of the Department of Environment, Land, Water and Planning (DELWP)—it has not identified all potential sources of harm from unconventional gas activities. It has not transparently documented its rationale to its staged approach to the assessment of all potential risks, or identified and prioritised further stages of work required to inform a decision in relation to the moratorium.

When exploration activities began in the early 2000s, DEDJTR did not analyse what information it had to determine what it needed to adequately assess the potential environmental and social risks and impacts associated with these activities.

Between 2000 and 2012, when unconventional gas exploration activities were approved, DEDJTR's response to identifying and assessing the risks was slow, informal and ad hoc. After 2012, its approach significantly improved but gaps still remain. There is no clear documented rationale explaining its staged approach to the assessment of risks. Gaps in information and analysis still remain in terms of identifying all potential risks that require assessment.

DEDJTR's approach and activities to identify broad community concerns has been comprehensive. It has made good progress in partnership with DELWP in identifying and assessing the key risks to water resources. However, this has occurred outside of the development of a comprehensive desktop risk management strategy that identifies DEDJTR's approach to assessing all potential risks, its rationale to its staged approach and the identification and prioritisation of works to identify and assess key potential risks. These include potential risks to current land uses, the landscape and its values, human health and air quality.

This has further delayed the identification of priority actions, the collection of data and knowledge needed to inform the decision in relation to moratorium and the sustainability of an unconventional gas industry in Victoria. Making evidence-based decisions was one of key aims of the moratorium since 2012.

2.3 How has DEDJTR informed itself and government of the risks?

The *Mineral Resources (Sustainable Development) Act 1990* and *Petroleum Act 1998* require both the environment and communities to be protected from risks associated with unconventional gas activities. This requires the regulator to undertake a comprehensive approach that identifies and assesses all known and potential risks. This involves three steps:

- risk identification and assessment
- risk management
- risk communication.

The first step—risk assessment—involves an assessment to identify potential and known sources of harm, followed by an assessment of the likelihood that harm will occur, and the consequences or impacts if it does occur. Risk management refers to evaluating which risks require management based on their likelihood and consequence, and selecting and implementing the plans or actions that may be taken to ensure that those risks are controlled. Risk communication involves an interactive dialogue between stakeholders, risk assessors and risk managers.

A risk management strategy forms the key basis of the regulator's overall approach to identifying, assessing and managing risk and communicating its approach to achieving this. A strategy transparently communicates the context for the regulator's work and its decisions.

DEDJTR does not have a documented risk management strategy or any other document that transparently outlines its approach to identifying and assessing the potential and known risks of unconventional gas activities. Although it has undertaken a gated and staged approach since 2013, the scope of work required to identify the potential risks and the staging of its work has not been identified or clearly documented.

Victoria's unconventional gas industry was in its infancy in Victoria prior to the 2012 moratorium which put a halt to all new coal seam gas (CSG) activities. The intent of the moratorium was to assist the government to make an evidence-based assessment of the viability and sustainability of such an industry in Victoria.

As there is currently no unconventional gas activity in Victoria it is not expected that DEDJTR complete all three steps of a risk management process. However, it is reasonable to expect that DEDJTR would comprehensively identify and document all potential risks from unconventional gas activities, prioritise these for assessment and identify the scope of work required to complete this.

To adequately do this, DEDJTR needs to undertake a desktop review of all current literature and information to identify gaps and what needs to be done to fill these gaps.

Before a decision is made on the moratorium a comprehensive assessment of the likelihood and consequences of all potential risks should be undertaken. This should be supported by analysis of whether best practice controls can manage high risks to acceptable levels. These steps and their outcomes must be transparently communicated to all stakeholders.

2.3.1 Prior to 2010

Prior to 2010 the former Department of Primary Industries and its predecessor, the former Department of Natural Resources and Environment—now DEDJTR—conducted only limited and ad hoc activities to collect and analyse data and information to build its knowledge around the potential risks in Victoria. It adopted a deliberately light-handed approach to the identification of risks because:

- evidence and concern about the risks and impacts of this industry was only slowly emerging globally
- it considered that the number of activities, and therefore overall risk of this industry relative to other earth resource industries, was low
- the exploration activities approved were deemed to be manageable under the current regulatory system
- the interest in developing this resource in Victoria was low and there were no production activities
- it believed that its regulatory practices represented good practice and met international standards.

However, DEDJTR did not validate its assumptions where environmental risks were concerned. It also did not collate information and data to identify gaps around the potential risks.

There was a flurry of new licence and work applications to explore for CSG from the late 1990s to the first half of the 2000s. DEDJTR continued its established process of offering onshore areas with potential resources for tender, which allowed exploration for tight and shale gas. Departmental briefings show CSG was first raised as an issue with the relevant minister in 2003 and 2004 mainly due to a perceived growing demand for CSG as a potential energy source. Briefings indicated that CSG was a new industry with new processes that posed new risks. DEDJTR did not propose actions to further identify and assess these risks, even though multiple exploration and hydraulic fracturing proposals had been approved.

The Minister for Energy and Resources' 2004 *Ministerial Statement* supported the development of CSG. Its commitment to review legislation only related to ensuring it did not present barriers to the exploration of this resource. The statement did not raise the issue of identifying or addressing the risks associated with CSG. The overall assumptions relied on by DEDJTR during this time were that the production of CSG was unlikely in the short term and that the current level of unconventional gas exploration activities represented a generally lower risk than other earth resources industries at the time.

The risks of unconventional gas exploration activities vary dependent on the resource, the area and the activity. Drilling deep into rock layers that are not adequately mapped, as part of tight and shale gas exploration, involves significant uncertainty and therefore inherent risk. CSG exploration can also involve drilling several wells that can be active for months during which a significant amount of groundwater needs to be extracted to release the gas. Hydraulic fracturing, which has been used in exploration in Victoria, can be high risk where there is an absence of good baseline data.

DEDJTR's approach did not improve even in the face of increasing public awareness about the risks of unconventional gas both here in Australia and overseas. It did not brief the relevant minister on unconventional gas development in Victoria from 2004 until 2011.

2.3.2 Between 2010 and 2012

Between 2010 and 2012, unconventional gas caught the attention of the Victorian community. There was a lot of focus on hydraulic fracturing nationally and internationally following events such as the release of the 2010 documentary *Gasland*. There was also increasingly vocal community concern about the impacts of hydraulic fracturing for CSG in Queensland and New South Wales (NSW).

A number of comprehensive international studies emerged identifying the challenges and risks of unconventional gas activities. Victorian and Australian concerns were focused on CSG because it was the predominant target of onshore gas exploration and production. Hydraulic fracturing is often not required for CSG—only one in eight wells in Queensland use hydraulic fracturing—compared to tight and shale gas where it is always required.

In 2011, the Council of Australian Governments saw the need to develop nationally consistent practices to manage the risks related to CSG. The first step in this process was to identify all the potential risks.

DEDJTR actively engaged with other states and the Commonwealth to build its knowledge around the risks and challenges posed by CSG extraction. This was evidenced by:

- its contribution to the Council of Australian Governments' *National Harmonised Regulatory Framework* and *Multiple Land Use Framework* working groups
- DEDJTR initiating its own CSG working group with the then Department of Sustainability and Environment and the Environment Protection Authority to identify water risks and issues.

However, the data and intelligence obtained from these initiatives was not centrally collated, analysed or used to inform a better approach. The knowledge obtained did little to change DEDJTR's or the government's approach and attitude to understanding or managing the risks of unconventional gas activities.

This was evidenced in its 2011 briefing to the Secretary on the risks of hydraulic fracturing and the associated community concerns. It identified potential environmental risks and issues, particularly in relation to groundwater, land-use conflicts and the potential for earth tremors as a result of hydraulic fracturing activities. However, it advised that no policy or regulatory response was required to address these risks because:

- it deemed the objective-based regulation in place required all key risks to be identified and managed and as such provided sufficient environmental protection
- DEDJTR considered that it had equivalent processes to those introduced in Queensland to assess and manage risks
- the early stage of the industry in Victoria did not warrant more detailed consideration of risks—this was to be reconsidered should any commercial activities be proposed.

Again, this advice was not based on any review, benchmarking or other validation process that the identification and management of risks elsewhere meant they could be managed well here.

2.3.3 Since 2012

Since late 2012, DEDJTR significantly improved its processes and effort to identify the risks of unconventional gas and used this to inform its decision-making and advice. This was done in response to increasing community concern, state and national reviews, national initiatives to improve the management of CSG and the introduction of the Victorian moratorium.

DEDJTR conducted reviews, consulted more broadly and actively identified the work required to identify a number of the key risks and community concerns. These were seen as key steps in informing the government's decision around a decision in relation to the moratorium. Successive state governments, however, placed much of this work on hold out of concern that it could be seen to pre-empt a decision to lift the moratorium.

The moratorium was introduced in 2012 for CSG and expanded in 2013 to include tight and shale gas. It was introduced to allow time for information and data to be gathered to develop a sound understanding of the risks and impacts of onshore unconventional gas activities so an informed decision could be made at the end of its period. Work focused on assessing impacts to resources and identifying key community concerns. DEDJTR commenced a program in late 2012 to engage with a wide range of stakeholders. As part of this process it initiated, participated in and responded to a range of Commonwealth and state reviews and working groups.

Key actions included:

- participating in the 2013 *National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development*
- responding to recommendations made by two key Victorian inquiries: the Economic Development and Infrastructure Committee of Parliament's 2012 *Inquiry into greenfields mineral exploration and project development in Victoria* (the EDIC inquiry) and the former government's 2013 Gas Market Taskforce
- responding to recommendations made by the Earth Resources Ministerial Advisory Council established to advise the Minister for Energy and Resources on key matters of relevance to earth resources industries.

A number of key studies and initiatives were put in place in 2013 to further DEDJTR's understanding of the risks and concerns. DEDJTR is mainly responsible for delivering these commitments, although DELWP has key roles as well. These initiatives include:

- a 12-month community engagement program—DEDJTR
- major water science studies—DELWP
- the Gippsland basin bioregional assessment, managed by the Commonwealth Government.

These latter studies focus on key water resource risks even though an increasing body of national and international literature identified key risks to biodiversity, the landscape, air quality—including greenhouse gas emissions—and human health.

Community engagement and identification of risks

If unconventional gas development proceeds in Victoria it is likely to have a significant impact on land owners and local communities, as this has occurred in all other areas world-wide where such an industry is present. Unconventional gas resources tend to be located underneath land with other high-value uses, such as agriculture, as seen in the Gippsland and Otway basins. This can create opportunities for both industry and landowners, as it is possible to have both unconventional gas and agriculture in the same location. It can also potentially generate land-use conflict and social impacts, particularly around land access, and the liveability and amenity of areas.

Landowners may experience increasing competition for natural resources, such as land and water. Neighbouring communities may experience other negative impacts from unconventional gas activities including dust, noise, increased traffic and landscape visual impacts. Compared to conventional gas developments many more landholders are likely to be affected due to the large area both above and below ground that may be impacted by the industry.

Victoria has been slow to engage with the community on unconventional gas information and issues. This need was recognised since at least 2006 when industry pushed for government to provide more information. The EDIC inquiry also recommended consultation in 2012. Limited consultation started soon after this, but was interrupted when the moratorium was introduced.

Community engagement recommenced in 2014 following a government commitment to do so, and was reported on in 2015. It was comprehensive and led by DEDJTR and aimed to understand community views, concerns and risks in relation to an unconventional gas industry in Victoria. The approach used for the community engagement program largely met the better practice elements of VAGO's 2015 better practice guide on *Public Participation in Government Decision-making*.

However, it did not include a clear description of the decision to be made following the consultation, nor did it adequately advertise meetings. Meetings were advertised in local papers, which was inadequate given the extent of electronic social media options and other traditional means, such as the use of peak bodies and town notice boards.

The results identified polarised opinions on onshore gas. Up to 46 per cent of those surveyed opposed an industry in areas where unconventional gas activities are most likely to occur, while a large proportion of the community—44 per cent—remained undecided.

Those opposing the industry tended to focus on environmental and community risks and those supporting, on economic benefits. The key concerns of those opposing unconventional gas included:

- the need for the industry has not been established
- there are potentially substantial, long-lasting and unacceptable risks to the landscape, regional character and natural resources—particularly groundwater, agricultural productivity and biodiversity
- there are many risks and potential long-term costs, for likely shorter-term gain
- there is a high level of scientific uncertainty about what the risks are for Victoria and the successful management of these
- the system is not fair, as landholders cannot veto exploration or production and do not have equivalent negotiating power for compensation and rehabilitation
- public health concerns
- poor capacity of the regulators and regulatory system to manage the impacts.

There was a high level of agreement about the need for government control and more information. Those supporting the industry believed that there was significant misinformation about some of the potential risks and impacts and that information sources about risks lacked credibility.

Providing the community with more independent, peer reviewed scientific information that is transparent and accessible should assist people who do not have an opinion to form one. This is a key aim and outcome of developing a risk management strategy. It also provides assurance to those concerned that the risks have been comprehensively identified and assessed and can be appropriately managed if an industry proceeds.

Water science studies

There are a number of significant water science studies underway in Victoria to examine the possible impacts of an onshore natural gas industry on Victoria's surface and groundwater resources in the Gippsland and Otway basins.

The 2015 $10 million bioregional assessment of the Gippsland Basin is being conducted by the Commonwealth agencies with DELWP and DEDJTR receiving $2.4 million to conduct the Victorian work. The focus of this assessment is to better understand the possible impacts of CSG and coal mining developments on above and below ground water resources and assets. This assessment is limited to the groundwater systems close to the surface, not the deeper groundwater systems potentially impacted by tight and shale gas exploration.

A further program of water science studies commenced in 2014. It is being led by DELWP with participation from DEDJTR. It aims to improve the understanding of Victoria's water resources in the Gippsland and Otway basins and is assessing risks and impacts to both shallow and deep groundwater systems.

These studies examine the potential impacts from all forms of onshore gas—CSG, tight, shale and conventional. The original focus of the studies was to assess impacts from both individual projects and cumulative impacts from multiple projects. Priority was, however, given to investigating only the potential cumulative impacts from multiple gas projects. The studies are described by DELWP as initial screening studies to inform further work. The government's November 2013 announcement extending the moratorium, however, identified the studies as 'a major benchmarking study of the underground water across the state'.

The final reports are due late 2015. Draft reports were provided to VAGO and included explanations of how CSG, tight and shale gas extraction could impact groundwater resources in the two basins, using the current conditions as the baseline.

Each report described where unconventional gas resources might be located, where the water resources are and what the potential connections were. For the areas where the science showed that water and gas resources were connected, the reports assessed the potential impact that CSG, tight and shale gas extraction may have on groundwater, surface water and the connected ecosystems. Where impacts were rated moderate to high, the reports recommended potential risk mitigation controls and identified the residual risks to water resources after controls are applied.

These studies used the limited information that was available and collected additional data but this was limited by the budget available. The studies do not address:

- well integrity issues
- water usage requirements, particularly associated with hydraulic fracturing
- site decommissioning and well abandonment issues.

The reports provide very limited and generic discussion of risk mitigation controls for the identified high risks, which was one of the initial aims of the studies. Additional information is still required to address gaps around geology, resource potential, the relationship between groundwater and river flows and the connection of above ground ecosystems to groundwater.

Further work will be required to ensure evidence-based decision-making occurs in relation to unconventional gas development. This should include:

- a comprehensive risk identification process
- impact assessments based on comprehensive information
- a more detailed assessment of risk mitigation measures required to adequately control risks.

The approach of the two departments to focus on key water resources risks is reasonable as this was identified as one of the most important risks through national and international scientific studies and the community consultation process. However, as discussed previously the other stages to support this work and further identify and assess other risks have not been identified or documented.

There are a range of other issues relevant to the development of an unconventional gas industry. Consideration of other impacts, risks and mitigations is required to arrive at an overall balanced assessment of the sustainability of such activities in Victoria. Through reviews of national and international reports and discussions with eminent experts we have identified a range of other risks that should be considered as a part of any risk assessment process. These are outlined in Section 2.4.

2.4 What is known about these risks in Victoria?

Since 2012, all states in Australia have either undertaken or commenced an inquiry or review into the environmental risks of unconventional gas. Our review of this information and the significant body of scientifically peer-reviewed international reports identified a significant range of risks commonly associated with unconventional gas activities. Figure 2A summarises these.

Figure 2A
Potential risks of unconventional gas activities

Risk	Type of gas			Potential impacts
		CSG		
	Shale/ tight	Hyraulic fracturing	No fracturing	
Water resource risks				
• Water usage	✓	✓	x	Decreased groundwater quantity available for other uses
• Produced water	x	✓	✓	Pollute surface waters, groundwater, soils, food and livestock
• Flowback water	✓	✓	x	Pollute surface waters, soils, food and livestock
• Disposal of produced solids	✓	✓	x	Pollute soils, surface water and groundwater
Groundwater contamination from fracking				
• Fracking fluid leakage from poor well design, construction and integrity	✓	✓	x	Pollute groundwater—impact irrigation, stock and drinking water quantity and quality
• Chemical contamination from poor storage and surface spills of fracking chemicals	✓	✓	x	Pollute groundwater—impact irrigation, stock and drinking water quantity and quality
• Chemical contamination through leakage of fracking chemicals and flowback water into fracking cracks	✓	✓	x	Pollute groundwater—impact irrigation, stock and drinking water quantity and quality
• Natural gas released or disturbed by fracturing might seep into groundwater aquifers and other wells	✓	✓	✓	Pollute groundwater—impact irrigation, stock and drinking water quality and quality
• Disposal of used fracturing fluid, produced water or waste products	✓	✓	x	Pollute groundwater, surface water and other wells.
Air contamination from wells and infrastructure				
• Point source methane released from a well, leak in a pipeline or plant equipment	✓	✓	✓	Impact amenity and human health and climate change impacts
• Fugitive emissions from fractures and cracks in the ground	✓	✓	✓	Pollute groundwater quality and impact vegetation and climate change impacts
• Fracturing fluid can contain volatile organic compounds (VOCs) which can be released into the atmosphere	✓	✓	x	Impact amenity and human health
• Naturally occurring contaminants and radioactive materials in groundwater can be bought to the surface through drilling	✓	✓	✓	Pollute soils, surface water, stock and create prescribed wastes
• Drilling equipment and trucks produce emissions	✓	✓	✓	Impact amenity and human health
Landscape impacts from surface infrastructure or seismic surveys				
• Scale of footprint on landscape	✓	✓	✓	Impact landscape and biodiversity values, habitat fragmentation and community amenity, decreased land values
• Vegetation removal	✓	✓	✓	Impact biodiversity values, habitat fragmentation and soil quality
Seismic activity				
• Seismic activity from aquifer injection	N/A	✓	N/A	Impact landscape and biodiversity values
• Seismic activity from hydraulic fracturing	✓	✓	x	Impact landscape and biodiversity values
Operational activities				
• Noise	✓	✓	✓	Impact amenity and human health
• Dust	✓	✓	✓	Impact amenity and human health
• Increased infrastructure	✓	✓	✓	Impact amenity
• Increased traffic and population	✓	✓	✓	Impact amenity
Well integrity				
• Well leakage	✓	✓	✓	Pollute groundwater – impact irrigation, stock and drinking water quality
• Well blowouts	✓	✓	✓	Pollute surface and groundwater – impact irrigation, stock and drinking water quantity and quality
• Abandoned wells	✓	✓	✓	Pollute groundwater – impact irrigation, stock and drinking water quantity and quality
Depressurisation of the coal seam				
• Changes in pressures of adjacent aquifers	x	✓	✓	Impact groundwater availability
• Reductions in surface water flows in connected systems	x	✓	✓	Impact surface water availability
• Land subsidence over large areas	x	✓	✓	Impacts surface water systems, ecosystems, irrigation and grazing lands

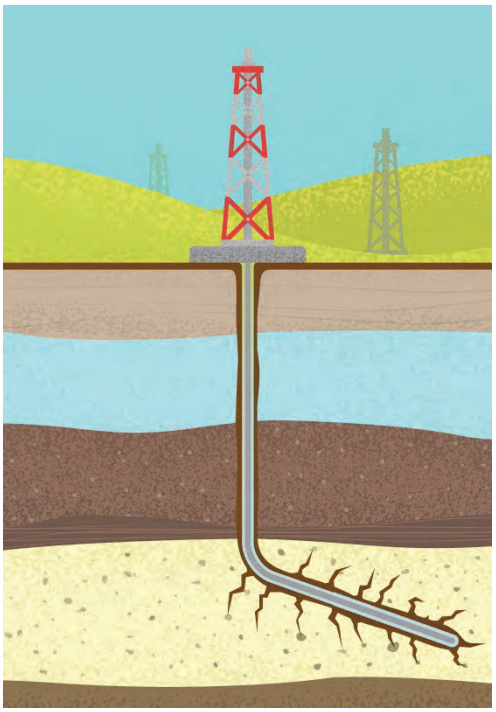
Source: Victorian Auditor-General's Office.

Many of these risks are also common to other traditional industries and existing land uses. Conventional gas extraction, agriculture and landfills can all pose these risks to the same level, as an unconventional gas industry, or more so.

However, it is the scale of risks posed by unconventional gas activities as opposed to conventional gas activities. Unconventional gas activities can affect larger areas of land than traditional industries and land uses. Unconventional gas is dispersed across large underground areas within coal seams and the pores of deep dense rock formations, rather than being trapped in a discrete reservoir as is the case for conventional gas. Therefore, development across larger above and below ground areas is required to make extraction commercially viable. As such, the scale of potential impacts is much greater.

Moreover, advances in drilling technology combined with staged hydraulic fracturing processes have allowed previously unattainable unconventional gas resources in onshore areas to be accessed. These areas underlie existing land uses, particularly agricultural land in Victoria, resulting in a range of potential site specific land and resource use opportunities and conflicts. These combined have led to a number of key risks. The following sections examine what is known about these risks in Victoria given its geology, landscape and regulatory system.

2.4.1 Hydraulic fracturing



Hydraulic fracturing cracks the rock layer at planned intervals along a horizontal well.

Hydraulic fracturing generates small fractures in rock formations to increase their permeability and to allow greater gas extraction. It involves pumping fluid—comprised mainly of water but also a small proportion of sand and often chemicals—into the rock formations at high pressure.

The main risks of hydraulic fracturing are:

- underground contamination from the hydraulic fracturing process and the chemicals used
- surface contamination from hydraulic fracturing chemical handling, use and storage
- induced seismic activity.

There are also risks from produced water but these are addressed in the Section 2.4.2.

The scale and impact of risks will vary according to the regional and site specific geological and hydrological characteristics, the type of gas, well integrity practices and the hydraulic fracturing technique. Preliminary results from water science and resource studies in the Gippsland and Otway basins indicate that not enough is known about the geology in either basin to know whether hydraulic fracturing would be effective in extracting tight or shale gas. While it is assumed that hydraulic fracturing would not be needed for CSG, further work is required to confirm this.

A comprehensive range of national and international studies have concluded that the risks from hydraulic fracturing can be managed to an acceptable level provided that:

- the wells are sited correctly
- there is an available and accessible water source
- best practice well integrity standards for design, construction and operation are implemented.

Further work will need to be undertaken to identify whether the potential risks from hydraulic fracturing can be minimised to an acceptable level in the Gippsland and Otway basins.

In terms of the surface contamination risk of hydraulic fracturing chemicals, Victoria announced a permanent ban on the use of toxic BTEX chemicals in hydraulic fracturing in November 2014, as these have been linked to numerous serious health impacts. While the impact of chemicals in the environment is regulated under the *Environment Protection Act 1970*, there are no specific licence or work plan conditions that require the toxicity of hydraulic fracturing chemicals or the wastewater produced containing the chemicals to be tested. There is also no requirement to release information to the regulator or the community on the types, concentrations or toxicity of the chemicals used.

Injecting water at high pressures or withdrawing groundwater from aquifers as part of hydraulic fracturing has been linked with increased but minor seismic events, or earth tremors. Scientific studies indicate Gippsland is an area of moderate seismic activity, whereas the Otway Basin has low seismic activity. Preliminary studies indicate that the risk of seismic activity arising from hydraulic fracturing for tight and shale gas in both these basins is low. Scientific literature supports the findings that the risks of increased seismic activity that can be felt, arising from hydraulic fracturing, is low.

Induced seismic activity has been more conclusively linked with the reinjection of produced and flow back water into aquifers. The Victorian water studies did not assess this risk. Aquifer reinjection is not current practice in Victoria. If this is deemed to be best practice for the management of produced and flow back water, an assessment of risks associated with this practice is required under the *Water Act 1989* before a regulatory decision can be made on its sustainability as an appropriate water management practice.

2.4.2 Risks to water resources

Multiple processes and practices associated with the extraction of unconventional gas pose risks to both the quantity and quality of ground and surface water resources and their users over a large area. These risks include:

- poor well integrity practices
- the extraction of large volumes of groundwater associated with CSG removal
- water usage associated with drilling and hydraulic fracturing processes
- management of produced and flow back water
- leakage from abandoned wells
- management of surface wastewater and chemical spills.

There is a strong reliance on groundwater for town water supplies in the Gippsland region with less reliance in the Otway region. There is also a demand for water for agricultural uses in these prospective areas for unconventional gas activity.

The Victorian water science studies conducted in 2014–15 did not assess the likelihood or consequences of any of these risks, with the exception of an initial screening of the impacts associated with the extraction of large volumes of groundwater associated with CSG activities. The volumes of water required for hydraulic fracturing over the lifetime of a well is generally not large compared to other uses, such as irrigation, large industrial activity and town water supplies. Up to 20 mega litres (ML) of water can be required per hydraulic fracturing event to extract unconventional gas. In comparison, Southern Rural Water's 2012 *Gippsland Groundwater Atlas* identifies that there are industries, farm businesses and towns in Gippsland that use more than 2 000 ML annually.

However, as most shallow groundwater resources in the Gippsland and Otway basins are either at or close to their allocation limit, any demand imposed on these resources by an unconventional gas industry will be difficult to meet. The only way for any new industry to access groundwater is through the trading of existing water rights. Trading existing water rights in close to, or fully allocated groundwater systems can be difficult in terms of obtaining long-term security for the quantities of water that may be required.

While deep groundwater systems are addressed under the current water licensing system, less is known about these deep aquifers and their sustainable yields, and therefore caps on their extraction have not yet been determined. CSG extraction results in significant amounts of produced water and there is controversy surrounding its management. Best practice requires the reuse of this wastewater—not disposal. This can be costly due to the large amounts produced and the treatment required to reduce salt and contaminants—either naturally occurring in groundwater or from hydraulic fracturing chemicals—before reuse.

Currently, it is the storage of this water prior to its reuse or disposal that creates a significant risk. Storage ponds have the potential to impact groundwater through leakage, or to impact surface waters from overflows. In NSW and Queensland the use of evaporation ponds is banned due to their potential environmental and amenity impacts and they are not seen as a method supporting the reuse of the wastewater. In Victoria the use of evaporation ponds is not banned, but is subject to regulatory approval.

Reinjecting treated wastewater back into deep aquifers via depleted wells is one method of managing and disposing of produced water. It is routinely used in many areas in America and is gaining more popularity in Queensland and NSW. Reinjection is prohibited in Victoria under state environment protection policies unless the water is treated to a high standard prior to injection. There are many knowledge and cost barriers to the use of this method in Victoria because not enough is known about the short- and long-term impacts of reinjection on groundwater systems and their dependent ecosystems.

This activity has been linked to increased seismic activity in a number of states in America.

The process for decommissioning an unconventional well is known as plugging and abandonment. Failure to decommission and manage abandoned wells properly may allow contaminated water, left over hydraulic fracturing chemicals and other hydrocarbons, particularly methane, to reach the surface and adversely affect vegetation, air quality, and greenhouse gas emission levels. They can also contaminate surrounding groundwater. These risks can occur at a greater scale for unconventional gas than for conventional gas operations due to the potential number of wells and their spread over larger areas.

Abandoned well locations are not centrally mapped in Victoria and there is no requirement for their long-term management. Evidence overseas indicates abandoned wells can have an impact 50 years after their closure. In Victoria monitoring and integrity checks are only required for up to three years after abandonment.

Rehabilitation and aftercare practices at unconventional gas well sites in Victoria—including the management of suspended and abandoned wells—have been poor. Better practice well approaches have not been required for these activities and DEDJTR has not effectively monitored them.

2.4.3 Risks to the landscape

Risks to landscape values from unconventional gas activities have not been assessed in Victoria, except for land subsidence as part of the 2014–15 water studies. This risk was initially rated moderate for CSG and low for other gases in the Gippsland Basin and low for all gas types in the Otway Basin.

Due to the large surface area affected by unconventional gas activities, the cumulative impact on the landscape and its values can be much greater than from conventional gas development. Changes in land use and form can result in significant impacts on biodiversity through vegetation and habitat loss. The Gippsland Basin in particular has significant flora and fauna sensitivities within and adjacent to it, which require a high level of protection. Changes to the local landscape due to above ground infrastructure, can also lead to significant impacts on local community amenity, especially in farming and regional areas.

2.4.4 Cumulative impacts

The 2014–15 Victorian water studies assessed the cumulative impacts of an unconventional gas industry on water resources, but not the cumulative social impacts or the cumulative impacts to water resources from all land uses. The impacts from all land uses within a region over a large scale and time can be significant. The potential risk of cumulative environmental and social impacts in Victoria is high due to:

- the scale and density of unconventional gas infrastructure and associated works—including increased noise, traffic and dust
- the long-term nature of unconventional gas activities
- the fact that the sedimentary basins where unconventional gas resources may be located are already under considerable pressure from agricultural activities and other demands on the natural resources.

Impacts are traditionally assessed, and activities approved, on a project by project basis. Cumulative impacts to the landscape, its environmental and social values across a region over time are generally not assessed or taken into account by the current regulatory system. To identify and assess cumulative risks and impacts, a comprehensive understanding of how all current and future activities impact the community, the land and the environment both above and below ground is needed.

Unconventional gas wells, access roads and associated infrastructure can be widespread in some commercial developments.

2.4.5 Fugitive emissions

Fugitive emissions can occur as a result of unintentional gas leaks from wells and from the surrounding land as a result of underground activities. The potential risks associated with fugitive emissions from unconventional gas activities have not been accurately assessed in Victoria or elsewhere. One of the principal benefits of unconventional gas is the reduction of combustion and therefore greenhouse gas emissions relative to other fossil fuels. However, uncontrolled fugitive emissions could partially undermine these gains. The emissions can impact air quality, groundwater quality, vegetation and community amenity, and can result in increased greenhouse gas emissions.

Intentional gas releases can be effectively managed and monitored using current techniques and the current approvals system. There is no licence or regulatory requirement to assess and monitor fugitive emissions across the area and life cycle of unconventional gas activities in Victoria.

Unintentional releases are not easy to assess, manage or monitor given the potential above and below ground footprint of the industry. They may be the result of poor installation and maintenance of wells or of underground events, such as fissures caused by hydraulic fracturing or from coal seam depressurisation. The magnitude and risk of fugitive emissions from unconventional gas activities has been the subject of a number of national and international studies. However, the results of these studies are contentious and have been challenged on the basis of the study design and the difficulty in accurately monitoring fugitive emissions.

Recommendations

To inform the government's review of the moratorium and subsequent decision about whether or not an unconventional gas industry should proceed in Victoria, that the Department of Economic Development, Jobs, Transport & Resources, in partnership with the Department of Environment, Land, Water and Planning:

1. develops a risk-based strategy which:
    - identifies known and potential risks to water, air, land and the community associated with the development of an unconventional gas resource using available information and data and the input of relevant agencies as needed
    - prioritises the actions that would need to be taken for an unconventional gas industry to proceed and identifies roles and responsibilities for these.

Recommendations – *continued*

Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed, that the Department of Economic Development, Jobs, Transport & Resources:

2. coordinates an interdisciplinary process with representatives from government departments, scientific organisations and industry to:
    - identify the baseline data needed—geological, hydrological, environmental and social—to be collected through regional studies at a level of resolution and accuracy that will enable future risks and potential impacts to be clearly identified and assessed
    - identify opportunities to fund this work.

3 Regulating unconventional gas activities

At a glance

Background

An extensive body of literature has identified key leading practices and core elements that must be part of any regulatory system to ensure the effective and sustainable development and management of an unconventional gas industry. The Department of Economic Development, Jobs, Transport & Resources (DEDJTR) has the primary responsibility for this in Victoria.

Conclusion

The regulatory environment is not yet ready to support future unconventional gas development activities should the moratorium be lifted and an industry be allowed to develop in Victoria.

Findings

- The regulatory system is ill-equipped to respond effectively to the variety and specific challenges posed by unconventional gas activities.
- The system does not meet the majority of the nationally identified leading practices for coal seam gas or specify mandatory technical and operational requirements—for example through codes of practice.
- DEDJTR approved exploration activities with only a limited understanding of the risks and the ability of the regulatory system to manage those risks.
- DEDJTR has not effectively overseen the compliance of unconventional gas activities with its requirements or administered the regulatory system.

Recommendations

That DEDJTR progresses a suite of reforms to strengthen the regulatory system's ability to manage unconventional gas, improves its compliance approach and adopts a reflective and adaptive approach to administering the regulatory system.

3.1 Introduction

An extensive body of literature has identified key leading practices and core elements that must be part of any regulatory system to ensure the effective and sustainable development and management of an unconventional gas and petroleum industry.

From the early 2000s, the department now known as the Department of Economic Development, Jobs, Transport & Resources (DEDJTR) received an increase in the number of unconventional gas exploration licence applications. These were for:

- coal seam gas (CSG), under the *Mineral Resources (Sustainable Development) Act 1990* (Minerals Act)
- tight and shale gas, under the *Petroleum Act 1998* (Petroleum Act).

DEDJTR responded to this increase in onshore unconventional gas activities by:

- applying the regulatory system to approve and manage the unconventional gas exploration licence applications and activity proposals
- reviewing the adequacy of the regulatory system and the need to reform it in light of emerging knowledge about the potential risks and impacts of unconventional gas and the better practice regulatory practices for managing them.

3.2 Conclusion

The regulatory environment is not yet ready to support future unconventional gas development activities should the moratorium be lifted and an industry be allowed to develop in Victoria.

Complexity, fragmentation and unclear responsibilities in the regulatory system will need to be addressed so that the system can be effectively, efficiently and transparently administered and complied with.

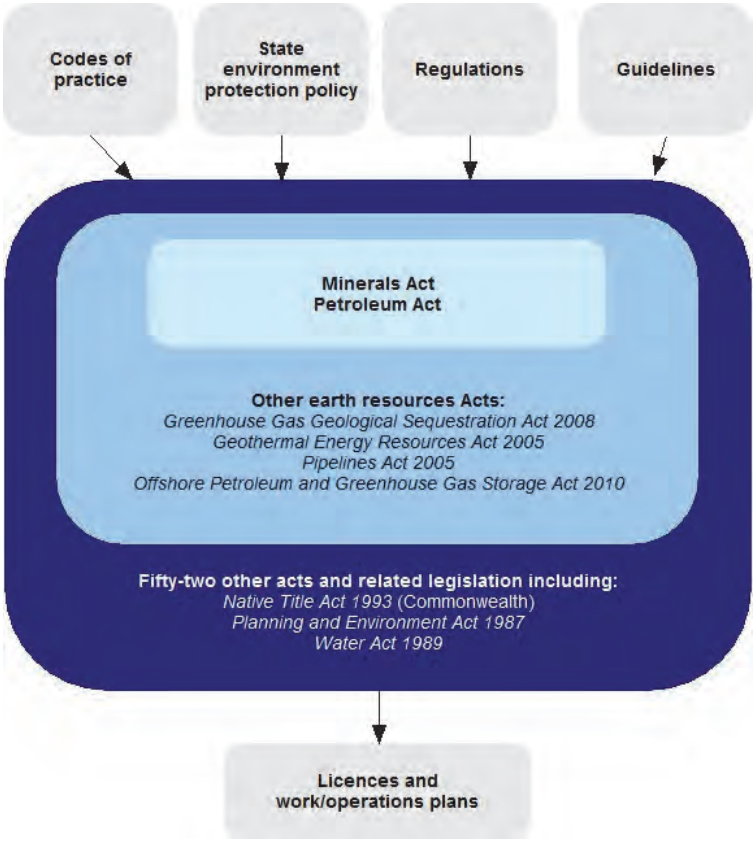
Reforms are also needed to address the distinct challenges associated with developing unconventional gas resources. Key challenges include the potential to impact over broad scale surface and subsurface areas, the cumulative impacts associated with a greater concentration of infrastructure, its coexistence or conflict with agricultural uses and environmental impacts associated with unconventional gas activities.

This audit's focus on unconventional gas has also revealed problems with the compliance and administration approach that DEDJTR applies to all earth resources, including unconventional gas. These should be addressed in a way that benefits the regulation of all earth resources. DEDJTR needs to develop the reflective and adaptive approach that is a hallmark of better practice regulation, so that it can respond to the challenges posed not just by any future unconventional gas activities but by other emerging industries and their associated risks.

3.3 The regulatory system

Victoria's system to regulate unconventional gas activities is complex, and shown in Figure 3A. It is fragmented and difficult to effectively implement, administer and comply with. A range of regulators have responsibility for its administration, but these roles and responsibilities overlap and duplicate. The complexity of this system—involving at its core 58 pieces of legislation—severely impacts its transparency, clarity and efficiency.

Figure 3A
The regulatory system



Source: Victorian Auditor-General's Office.

The regulatory system was established when the industry's focus was conventional oil and off-shore petroleum resources. Numerous reports from 2005 to 2012 raised issues with the capacity of the system to effectively regulate conventional petroleum and minerals industries even prior to questioning its suitability for unconventional gas activities.

The current Acts, regulations, codes of practice and guidance materials are ill-equipped to respond effectively to the variety, and specific challenges and risks arising from unconventional gas activities. Most jurisdictions nationally and overseas have specifically amended their regulatory systems to address unconventional gas activities. This has not occurred in Victoria.

Figure 3B provides our assessment of Victoria's regulatory system against better practice principles and practices. See Appendix C for a detailed assessment against these principles.

Figure 3B
Assessment of Victoria's regulatory system against better practice

Best practice elements	Regulatory system	
	CSG	Shale and tight
Transparency	◐	◐
Community engagement	◐	◔
Mandated environmental impact assessment	○	○
Comprehensive environmental management plan requirements	◐	◕
Hierarchy of risk control measures to all project aspects	◐	◐
Third party independent oversight	○	◔
Proactive information disclosure requirements	○	◕
Balanced exemption of land requirements	◔	◔
Fair and equitable land access and compensation requirements	◐	◔
Cumulative impact assessment requirements	◔	◔
Risk specific code/s of practice	◔	◐

Note: ● = element present and best practice
◕ = element largely met, but does not completely meet the principles
◐ = element partly met, but does not meet the principles
◔ = element partly present, but mostly inadequate
○ = element not present

Source: Victorian Auditor-General's Office.

Our assessment identified two key aspects that need to be addressed:

- the overlap and inconsistency between the Minerals and Petroleum Acts
- inadequate environmental regulation.

3.3.1 Inconsistent resource Acts

Best practice demands the consolidation of legislative provisions for the regulation of earth resources from six Acts into one resource management act. This would reduce complexity and the overlapping of roles and responsibilities of regulators, and would improve transparency. The 2014 *Earth Resources Statement* identified this as a key way to strengthen the regulatory system. DEDJTR provided the background work for this initiative along with recommendations, but this reform was placed on hold until a decision was made around the moratorium.

Creating a consolidated act would provide an opportunity to integrate a vast number of complex processes for the identification, release and approval of gas resources. There is currently unnecessary duplication and unclear inconsistencies between the Minerals Act and Petroleum Act approval processes:

- The Minerals Act requires licensees to apply the principles of sustainable development and to consult with the community at all stages of their activities but the Petroleum Act does not.
- The Petroleum Act requires environmental management plans for exploration activities but the Minerals Act does not.

Streamlining the regulatory framework is necessary given the similarities that exist between CSG, shale and tight gas exploration and production in terms of social and environmental impact and risk. Any differences in their environmental and social impacts can be managed within a revised framework—for example as a result of the water extraction that only occurs with CSG activities.

The current Acts do not adequately reflect the increasingly complex operating environment for the sustainable development of natural resources.

Numerous reports and reviews have noted that the current legislative framework generates an unnecessary regulatory burden for the development of earth resources. Consolidating requirements into one Act should also improve this.

3.3.2 Environmental regulation capability

The current system, regulated by DEDJTR, performs two functions:

- promoting and developing earth resources, by assigning rights for exploration and commercial production
- regulating the environmental, economic and social impacts of exploration and production activities.

While DEDJTR has separated these functions into two separate divisions within the department, having one agency perform both functions has been criticised as a potential conflict of interest in a number of jurisdictions. New South Wales (NSW), Queensland and Alberta, Canada have separated these two functions. For example, in NSW the regulation of environmental impacts from CSG is done by the NSW Environment Protection Authority (EPA) rather than remaining in the resources development and regulation division of the NSW Department of Industry.

Best practice requires ensuring capable and skilled regulatory oversight. This could be improved within the current regulatory system. This may involve increasing the capacity and capabilities of DEDJTR or considering a revised model where environmental regulation sits with the Victorian (EPA). The *Environment Protection Act 1970* (Environment Protection Act) and its associated regulatory tools, administered by the EPA, provide a mature framework for the protection of land, air, and surface and groundwater resources. EPA's role in protecting the environment, the adequacy of its statutory powers and the suite of tools that are available to it are currently under review. This review could be expanded to incorporate an assessment of the adequacy of the system to regulate the environmental impacts of unconventional gas activities.

3.4 Progress to address gaps and inadequacies

DEDJTR's 2012 assessment of the current regulatory system identified that there were gaps and inadequacies in its ability to manage the potential challenges and risks of unconventional gas activities. Our review confirms this, however, little has been done to address these deficits. This is largely due to government directing DEDJTR to halt regulatory reform activities so as not to pre-empt any decision on the moratorium.

Prior to the moratorium in 2012, DEDJTR focused little attention on identifying and addressing inadequacies in the regulatory system in relation to unconventional gas. DEDJTR's internal reviews of its approach indicated that CSG activities could be effectively regulated using the current system. The infancy of the unconventional gas industry along with an assumption that the current regulatory system would be applicable and effective were the reasons used to justify this approach.

However, at least 60 mineral licences allowing CSG exploration and 40 petroleum licences allowing tight and shale gas exploration were active between 2000 and 2014. If a resource had been developed Victoria may have found itself playing regulatory 'catch up' as was the case in other jurisdictions. Prior to regulatory reforms in Queensland and NSW, issues arose that generated mistrust of the regulator and the industry.

After 2012 DEDJTR recognised the need to implement regulatory reforms to better address the risks and impacts of an unconventional gas industry. It developed a range of initiatives to identify regulatory issues and the reforms required should an industry develop in Victoria.

DEDJTR undertook a comprehensive review of the regulatory system and its ability to effectively regulate CSG. It did not focus on tight and shale gas, but this reflected the approach nationally at the time.

In late 2012, DEDJTR prepared a comprehensive work program to implement changes recommended by this review process. Much of this work was reflected in the commitments made in government's response to the Economic Development and Infrastructure Committee of Parliament's 2012 *Inquiry into greenfields mineral exploration and project development in Victoria* recommendations and in the 2014 *Earth Resources Statement*. Proposed actions included:

- amalgamating the six earth resources Acts into one Act
- developing a risk-based and outcome-focused framework
- implementing a range of regulatory reforms specific to CSG
- developing a mandatory environmental impact assessment process
- banning the use of the BTEX group of chemicals
- implementing the practices of the *National Harmonised Regulatory Framework for Natural Gas from Coal Seams* (National Harmonised Regulatory Framework)
- trialling the national *Multiple Land Use Framework* 2013 to address potential land-use conflicts in Gippsland.

However, other than banning BTEX chemicals, limited work has been done in scoping, planning and implementing these actions. The focus of regulatory reforms has been on addressing issues relevant to all earth resources, such as introducing online, risk-based work plan applications. While these activities will benefit unconventional gas activities, they do not address the specific challenges and risks associated with unconventional gas.

3.4.1 Review against nationally agreed leading practices

In 2013, DEDJTR reviewed the regulatory system against the leading practices of the National Harmonised Regulatory Framework. All states had committed to doing this. This framework identifies four overarching leading practices and 14 additional leading practices for specific aspects of CSG regulation. The overarching leading practices are:

- comprehensive environmental impact assessments
- comprehensive environmental management plans
- a hierarchy of risk control measures for all aspects of CSG projects
- verification of key stages such as well design by a qualified, but not necessarily independent, person.

DEDJTR's assessment determined that Victoria's system met the first two practices and partially met the third, but did not meet the fourth practice.

Our analysis differs, and has determined that DEDJTR's assessment was deficient. It shows that the first two practices would not be met for either CSG or tight and shale gas activities. See Appendix C for details.

DEDJTR's assessment also identified that only five of the 14 leading practices in relation to well integrity, water management and monitoring, hydraulic fracturing and chemical use were not being fully met. As Appendix C demonstrates we found that the majority of these practices were not met.

Environmental impact assessment

Contrary to DEDJTR's assessment, Victoria does not implement leading practices to assess the environmental impacts associated with unconventional gas activities. Currently, the key legislation relied on for environmental impact assessments of unconventional gas activities is the *Environment Effects Act 1978,* through the development of an environmental effects statement (EES). The Minister for Planning has discretion about whether an environmental impact assessment is required once a proposal is referred. The guidelines specify an EES is required for CSG developments that 'could significantly affect the beneficial uses of water resources'. While CSG proposals are explicitly referred to in these guidelines, tight and shale gas proposals are not. In addition, the environmental effects statement process produces a recommendation which is not binding on decision-makers.

Victoria is a signatory to the *National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development.* Under this agreement all CSG applications require referral to the Commonwealth's Independent Expert Scientific Committee for assessment, prior to approval. There is no similar referral trigger and process for tight and shale gas operations.

Section 41A of the Minerals Act allows the Minister for Energy and Earth Resources to require an impact assessment of exploration activities and works. This is a discretionary provision, which has not been used. There are no transparent criteria or guidelines for when this provision should be enacted. DEDJTR's current work program includes examining how this provision can be better used.

There is no similar requirement under the Petroleum Act. Broad environmental assessment provisions exist, but these again are at the discretion of the Minister for Energy and Resources.

Environmental assessments as part of developing and approving an environmental management plan must be carefully distinguished from environmental impact assessments. The primary difference is that the Minister for Energy and Resources retains full discretion to issue an exploration or production licence despite the existence of identified environmental risks that may be outlined in an environmental management plan. Provided it identifies specific measures taken by the applicant to minimise the effect of such risks, the plan is deemed to be compliant with the regulatory requirements and an application may be approved. By contrast, an environmental impact assessment can influence the decision to approve a project or to impose any environmental management conditions.

No environmental assessment process in either the Minerals or Petroleum Acts is transparently focused on the key risks and issues of unconventional gas activities, as compared to other jurisdictions such as NSW and Alberta, Canada.

Part 4 discusses approaches to address this gap.

Environmental management plans

Victoria's environmental management plan provisions are not comprehensive. The Petroleum Act and regulations specifically require an environmental management plan and identify aspects that a plan needs to include. The Minerals Act and regulations only require such a plan for wells going into commercial production even though exploration can involve the drilling of wells and hydraulic fracturing. The Minerals Act and therefore CSG requirements are not risk based and do not delineate between conventional and unconventional gas activities.

Guidelines for coal seam, tight and shale gas activities do not comprehensively identify the risks posed by unconventional gas activities. Key gaps include:

- hydraulic fracturing risks
- abandoned wells
- baseline monitoring prior to drilling or hydraulic fracturing
- well integrity issues beyond those applicable to conventional wells
- managing produced water.

Our review of environmental management plans identified that while the plans had become more comprehensive, none adequately addressed these risks.

Independent oversight

Independent oversight can improve industry performance, improve trust by providing an independent perspective, and increase transparency of an industry's environmental performance. Independent oversight of a regulatory system can occur in a number of ways, for example through:

- review and oversight of key elements of the system by independent experts
- an independent body, such as a gas commissioner or mining warden.

There is no requirement for independent oversight of earth resources activities in Victoria—including unconventional gas activities. A mining warden was set up under the Minerals Act, but its key role is dispute resolution and this role is not mirrored in the Petroleum Act.

Other jurisdictions have incorporated independent oversight through a gas commissioner. This model is used in Queensland where a Gas Fields Commission has been established. Its powers and functions include:

- reviewing the effectiveness of legislation and regulation
- obtaining and publishing factual information
- identifying and advising on coexistence issues
- convening parties for the purpose of resolving issues
- promoting scientific research to address knowledge gaps
- making recommendations to government and industry.

In terms of better practice for independent oversight much can be learnt from the Victorian EPA's model for landfills and contaminated sites. Licensees are required to have independent oversight of their monitoring programs by an EPA approved auditor. The auditor regularly monitors, assesses and reviews the risks landfills and contaminated sites pose. Annual performance statements published on EPA's website show whether licence conditions were complied with and list any recommendations made by the auditor to address the identified risks and impacts.

In addition to independent oversight, an effective dispute resolution process must be in place. Currently the mining warden's role is limited to dispute resolution under the Minerals Act. This needs to be strengthened to also address disputes associated with tight and shale gas if an industry is to proceed.

Water issues

DEDJTR's assessment against the National Harmonised Regulatory Framework*'s* leading practices stated that the Environment Protection Act and the *Water Act 1989* (Water Act) provide the framework to comprehensively assess risks to groundwater and surface waters. This is not the case.

The Environment Protection Act establishes a framework for protecting land, water and air from industrial activities. However, unconventional gas activities—including hydraulic fracturing and activities that discharge wastes to water, air and land—are exempt from approval under the Environment Protection Act and its regulations unless, for example, they continually impact offsite. Rather they are assessed and approved under the Minerals and Petroleum Acts, which are not adequate for these activities.

The Water Act provides the framework to assess risks to groundwater, and to license water use and the discharge of water underground, as occurs in aquifer reinjection. The current unconventional gas challenges are not adequately addressed by the existing Water Act and water licensing framework. There are gaps and unclear roles and responsibilities that lead to a lack of transparency. Examples include:

- lack of clarity about how activities that extract water from coal seams should be licensed
- uncertainty about future water use requirements and how these will fit within the existing water capping allocation system—due to a lack of clarity around the considerations needed when a new water entitlement is applied for.

Victoria's water resources are managed in an allocation framework where allocations are capped for sustainable management. Existing users have licenses to take and use water. New uses for water, such as unconventional gas activities, are required to be licensed and managed within this framework and, where applicable, within the predetermined cap of the resource.

However, existing rights were allocated on a first come first served basis rather than as assessed against the region's economic, environmental and social priorities. Any new system for water allocation rights proposed under the reform of the Water Act should ensure transparent and evidence-based sustainable criteria for the allocation of water.

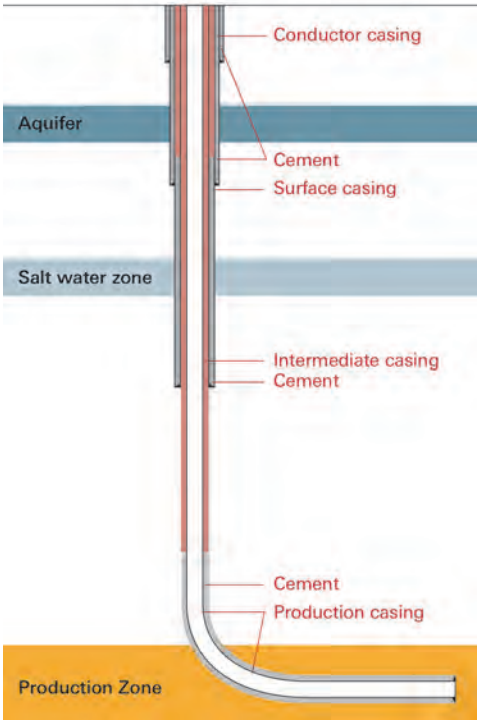
In summary, while DEDJTR has identified a range of issues with the current regulatory system, little if anything has been done to address them.

3.4.2 Establishment of best practice technical and operational standards

Victoria does not have codes of practice that are specific to unconventional gas or comprehensively address the scale of risks but there are several reasons for developing one, should unconventional gas activities proceed.

A key element of a better practice regulatory system is the description of best practice technical and operational standards to effectively manage well known risks—for example for well design as shown in Figure 3C. Many jurisdictions—both in Australia and overseas—use codes of practice to specifically manage unconventional gas activities. Identifying mandatory practices in this way provides industry with a significant measure of certainty about what it needs to do to manage risks. It also reassures the public that a responsible regulatory body is focused on the issue. A code of practice would be a transparent way of implementing the leading practices of the National Harmonised Regulatory Framework.

Figure 3C
Schematic of best practice gas well design, where multiple layers of reinforcement casings are used to minimise the risk of leaks



Source: Shale gas extraction in the UK: a review of hydraulic fracturing, The Royal Society and the Royal Academy of Engineering, 2012.

Victoria has a number of codes of practice, standards and requirements under earth resources and water legislation but these have significant gaps in specifying mandatory technical and operational requirements for unconventional gas activities when compared to other states, as shown in Figure 3D.

Figure 3D
Codes of practice used in Victoria, Queensland and NSW

Codified requirements	Victoria	Better practice examples
Exploration	Yes—but not specific to unconventional gas	NSW draft Code of Practice for Exploration of CSG 2012
Well integrity	No	NSW *Code of Practice for Coal Seam Gas Well Integrity* 2012
Hydraulic fracturing	No	NSW *Code of Practice for Coal Seam Gas Fracture Stimulation Activities* 2012
Well construction	No	Queensland *Code of Practice for constructing and abandoning coal seam gas wells and associated bores in Queensland* 2013
Aquifer protection from unconventional gas activities	No	NSW *Aquifer Interference Policy* 2013
Land access	No	Queensland *Land Access Code* 2010 and subsequent reforms
Produced water management	No	Queensland *Coal Seam Gas Water Management Policy* 2012 WA *Water in Mining Guideline* 2013
Emissions	No	Queensland *Code of Practice for coal seam gas well head emissions detection and reporting* 2011
Abandoned wells	No	Queensland *Code of Practice for constructing and abandoning coal seam gas wells and associated bores in Queensland* 2013

Source: Victorian Auditor-General's Office.

3.5 Regulation of exploration activities to date

DEDJTR, as the primary regulator of unconventional gas exploration, is responsible for issuing licences, approving activities under those licences and monitoring how those activities comply with its requirements.

Many recent reviews and inquiries into the management of unconventional gas risks here and overseas have identified that successfully applying best practice and managing risks relies on the regulator applying robust approval and compliance approaches.

We examined a selection of CSG, tight and conventional gas exploration licences and focused on the approval of work plans under the Minerals Act, and operations plans under the Petroleum Act—which we refer to generically as work plans—for drilling activities.

3.5.1 Approvals

There were at least 100 licences active between 2000 and 2014 that allowed exploration for unconventional gas. These often included multiple work plans under the one licence, for a range of exploration activities including seismic surveys, drilling for rock cores and gas well drilling and testing. DEDJTR has not issued any licences for commercial production.

DEDJTR introduced very few system-wide regulatory measures and minimal new guidance for managing the potential risks and impacts of unconventional gas over this period.

The measures it introduced in the early 2000s tended to be specific to CSG, which was a new commodity being explored for under the Minerals Act. These measures were largely borrowed from the Petroleum Act and included:

- introducing some petroleum drilling and well management practices—such as requiring blowout preventers to manage the risk of encountering pockets of gas while drilling into the coal—as mineral licence conditions
- asking licensees to select drilling sites that would have the smallest impact on the local community, heritage, existing land use and environment—for example by favouring sites on already modified farmland or on tracks already cleared of vegetation
- appropriately consulting with other agencies on some aspects—such as safety
- minimising chemical use, particularly the use of toxic substances
- reviewing several versions of work plans before finally approving them, to make sure the regulatory requirements were addressed.

However, DEDJTR did not uniformly adopt these measures into all relevant licence conditions and guidance between 2000 and 2012, as it did not consider there was a need to. It did not base this opinion on any review of how well the regulatory system had managed previous onshore gas activities or whether it was robust enough to manage the potential risks and impacts of unconventional gas that were known at that time. Instead, it relied on its assumptions that:

- the gas exploration activities proposed were low impact compared with the commercial extraction of the gas and low risk compared to activities to extract commodities such as gold
- the existing regulatory system was adequate as it incorporated risk management and environment protection approaches.

As a result, DEDJTR's approach to assessing and approving work plans prior to 2012 was inadequate for responding to unconventional gas risks:

- there was no additional policy, criteria or guidance for licensees, the community or departmental staff explaining the specific considerations in approving unconventional gas activities
- it did not inform or engage with the community on these new activities
- the work plans:
  - generally had little detail about specific potential impacts, risks and controls, for example identifying and managing underground risks and managing the suspension and decommissioning phases
  - tended to underestimate risk and overestimate the effectiveness of controls, particularly where the likelihood was low but the consequences were potentially significant.

Around 2011 DEDJTR received copies of the checklists and guidance about hydraulic fracturing and other unconventional gas risks being used in Queensland and other states. It did not formally include this guidance as part of its approach for assessing proposed unconventional gas activities. It did correspond with licensees, though, to advise them that new requirements were emerging and new work approaches would be needed, particularly in relation to hydraulic fracturing activities. It had also embarked on a series of community engagements on CSG in 2012 but this was curtailed when the moratorium was announced.

Because the moratorium was not expanded to include all onshore gas activities until late 2013, some licence and work plan applications and renewals were still approved and some exploration activities still proceeded until this time, particularly under the Petroleum Act. The content and risk detail in the work plans approved in 2012 and 201*3* improved, and DEDJTR is introducing a requirement for risk and outcomes based work plans under the Minerals Act, as recommended by the Economic Development and Infrastructure Committee of Parliament's 2012 *Inquiry into greenfields mineral exploration and project development in Victoria.*

However, there have not been any systemic changes to licensing and approval processes since 2012 to specifically address unconventional gas risks, as the government directed DEDJTR not to make any regulatory changes. DEDJTR is in the process of introducing risk-based work plans and approvals under the Minerals Act, as required by an amendment to the Act in 2014. DEDJTR advised it aims to introduce these by January 2016. These should improve the way work plans, which authorise a number of activities, identify and address risks. It should also improve the way DEDJTR assesses and approves the work for all mineral resources, including any future CSG activities.

Operations plans under the Petroleum Act only authorise a single activity, providing better scope to approve activities based on risk. In practice, this does not always lead to better risk-based plans and approval of those plans than occurs under the Minerals Act. Clearer requirements for risk-based plans are needed for plans made under the Petroleum Act.

DEDJTR's preparedness for any future unconventional gas activities will be impaired by weaknesses in its approval processes more generally, not just as they relate to unconventional gas. In particular:

- there is insufficient guidance for DEDJTR staff on the types of considerations and judgments that should inform work plan assessments and approval decisions
- DEDJTR's assessments are narrowly focused on the work plans and its approval decisions do not document broader considerations, such as the overall quality of the application, the licensee's compliance history and other relevant information.

There is one onshore drilling activity currently underway for natural gas. It involves drilling onshore in the Otway Basin to access an offshore, conventional petroleum source. The minister granted a special drilling authority for this despite the moratorium because the gas source is in an offshore licence area.

DEDJTR has taken a more stringent approach to managing the approval processes for this project, as it is considered high risk. The project uses the largest onshore drilling rig in Victoria to drill the longest extended reach well in the state, which passes through onshore aquifers that supply drinking water. DEDJTR's improved approach was evident in the:

- quality of the work plan and assessments undertaken before activity began
- requirements for baseline groundwater monitoring—the first time DEDJTR has required this onshore
- high degree of oversight by DEDJTR.

This approach should provide DEDJTR with a good foundation for improving its approvals process and regulatory activities more broadly, whether or not unconventional gas activities go ahead.

3.5.2 Compliance

DEDJTR manages compliance with legislation by providing information to licensees on how to comply, by using inspections and audits to monitor compliance with licence conditions and work plans, and by requiring licensees to remedy any noncompliances. It can also apply sanctions to licensees breaching their requirements, by issuing notices or prohibitions and ultimately through prosecution or cancelling the licence.

DEDJTR's compliance approach is not strategic, effective or efficient. It cannot be confident that it has targeted the high compliance risks, collected the right information to measure compliance and identify noncompliance, or addressed noncompliances consistently and fairly. This compromises its ability to identify emerging issues and to minimise adverse risks and impacts on the environment—an objective of both the Minerals and Petroleum Acts.

DEDJTR had not tailored its compliance approach to monitor or identify unconventional gas risks. For example, it did not identify high compliance risks associated with unconventional gas or target specific risks through its inspection and audit programs. Nor did it provide any additional information to licensees on how to comply with legislative and regulatory requirements.

The compliance activities DEDJTR has conducted have identified poor licensee practices in managing unconventional gas, including:

- reported breaches of aquifers
- repeated incidences of small fires during gas flaring activities and breaches in fire response arrangements
- licensees extending their operations beyond the approved work plan boundary
- noncompliance with fundamental requirements such as maintaining well integrity testing records, stormwater management, lining storage ponds and adequately supervising staff
- poor or no rehabilitation at several sites.

None of these incidents led DEDJTR to review or change its approach to regulating unconventional gas.

It would be difficult for DEDJTR to determine whether there were any long-term environmental impacts from these incidents because there are few requirements for environmental monitoring prior to, during or after unconventional gas activities.

DEDJTR has not adequately managed compliance with rehabilitation or well suspension and decommissioning requirements. The requirements and its guidance on how to comply with them are outdated, inadequate or—in the case of safely suspending wells that are unlikely to be tested or used again in the short term—absent. Other jurisdictions such as NSW and Alberta, Canada have specific requirements and guidance on these aspects of well management. DEDJTR has not monitored or maintained information on decommissioned wells, but a recent audit of wells regulated under the Petroleum Act identified problems with a quarter of the decommissioned sites visited.

Rehabilitated site in fenced area (left) and a poorly rehabilitated site with the sumps not filled in (right).

The frequency and nature of some of these noncompliances suggests that some licensees may be regularly or routinely ignoring compliance requirements. This could indicate that they perceive there is a low risk of being caught, that they are not deterred by the likely consequences, or that they are overestimating the effectiveness of their controls.

Better practice regulatory approaches apply a 'graduated' enforcement approach to noncompliance, where different levels of remedy and sanction are applied depending on the severity of the potential or actual consequence of noncompliance. The Minerals Act enables this by having a suite of tools that it can apply, but graduated enforcement is restricted under the Petroleum Act which only allows for prohibition notices, prosecution or licence cancellation.

Even though both Acts have reasonable penalties to deter noncompliance DEDJTR has not applied any penalties to unconventional gas noncompliances. The maximum under the Minerals Act is 2 500 penalty units, or $369 025, and under the Petroleum Act it is 600 penalty units. These are within the ranges of penalties provided in other legislation safeguarding natural resources—for example the maximum for fisheries and wildlife offences are 200 and 240 units respectively, and for pollution offences is 2 400 units.

DEDJTR's public reporting on compliance occurs largely through its *Annual Statistical Report* but this has limited value. It is primarily focused on the activities delivered, rather than how effectively they address known risks or issues and achieve legislative objectives, such as minimising environmental damage. The latest report (2012–13) had no information on compliance with the Petroleum Act and did not include key information on Minerals Act compliance, including:

- the measures DEDJTR uses to assess how effective its compliance approach is, and how well licensees are complying
- the purpose of the compliance activities conducted
- the number and nature of noncompliances identified
- whether compliance with identified issues is improving over time
- how its compliance activities contributed to achieving relevant objectives and outcomes.

The Department of Treasury and Finance's 2014 *Stage Two Statement of Expectations for Regulators Guidelines* (the DTF guidelines) identify that better practice is to inform the community about whether those being regulated meet their mandated requirements.

VAGO's 2012 audit *Effectiveness of Compliance Activities: Departments of Primary Industries and Sustainability and Environment* identified that the then Department of Primary Industries did not have a strategic, risk-based approach to managing earth resources compliance. The department—now DEDJTR—planned to implement the recommendations to improve the earth resources compliance approach between July 2014 and May 2015, although only two of the 22 actions identified have so far been completed. Following several changes in departmental structure, earlier this year DEDJTR also embarked on a process to implement the audit's recommendations to introduce a whole-of-organisation, risk-based approach to compliance.

3.5.3 Administration

DEDJTR's performance in administering the Minerals and Petroleum Acts and associated regulations provides an indication of how well placed it is to respond to new or emerging challenges, such as unconventional gas activities.

DEDJTR's administrative activities, systems and processes do not represent best practice.

The DTF guidelines are aimed at establishing clear expectations of regulator performance and identify eight areas of regulatory good practice. In three areas DEDJTR shows some of the characteristics of better practice. These include:

- **cooperation with regulators**—regularly coordinating with other agencies by participating in national and state unconventional gas working groups, although it needs to do more to clarify and streamline responsibilities that relate to the Environment Protection Act and the Water Act
- **clear and consistent regulatory activities**—improving administration practices, for example by using an electronic quality management system to continuously review its processes
- **timeliness**—striving to improve its electronic capability—for example by introducing online work plan applications.

In the other five areas DEDJTR will need to make considerable effort to meet the better practices:

- **role clarity**—it does not inform the community about levels of compliance
- stakeholder participation—it does not routinely involve stakeholders in risk identification, analysis and evaluation
- **accountability and transparency**—it does not use regular reviews to determine whether regulatory outcomes are being realised and publishing outcome-focused data on operational performance
- **risk-based strategies**—it does not consistently and transparently apply risk assessments, using risk information to target inspections and applying resources to the areas of greatest risk to the achievement of outcomes
- **compliance assistance and advice**—it does not provide assistance and advice to all regulated activities and tailor this for different sectors where needed.

In 2014, DEDJTR reviewed its performance in administering the regulatory system against earth resources regulators in other states, some Canadian jurisdictions and the Victorian EPA. The review concluded that DEDJTR's administration was much less developed than the other jurisdictions and made a number of recommendations for how it could improve its approach. Queensland and Alberta, Canada were identified as the most developed.

The department will need a more reflective, adaptive and systematic approach to drive effective regulation of emerging industries and issues. This will also help it achieve the better practice characteristics that DTF describes and to address the recommendations of its own review. DEDJTR issued new exploration licences for oil shale—another unconventional energy resource regulated under the Minerals Act—in 2012 and 2013. Additional applications for oil shale exploration licences have been on hold since 2014.

Recommendations

To improve the regulation of all earth resources, regardless of whether or not the moratorium is lifted and unconventional gas exploration and development allowed to proceed, that the Department of Economic Development, Jobs, Transport & Resources:

3. strengthens and clarifies the regulatory system to better manage all earth resources, giving consideration to:
    - consolidating the earth resources Acts into a new single, integrated earth resources management Act that is risk based and addresses environmental, economic and social priorities in decision-making
    - securing qualified, objective and independent environmental regulation capability and oversight for the licensing and environmental performance of earth resource industries through reviewing models from other jurisdictions
    - implementing a mandatory risk-based environmental impact assessment process
    - developing an approvals system that is risk based in proportion to the activities proposed, using risk-based work plans as one of the elements
    - requiring risk-based environmental management plans for all stages, from exploration to decommissioning and aftercare
    - requiring licensees to seek third party oversight and auditing for key elements of their environmental performance
4. improves its earth resources compliance approach, by addressing the recommendations of VAGO's 2012 audit *Effectiveness of Compliance Activities: Departments of Primary Industries and Sustainability and Environment*
5. introduces a reflective, adaptive and systematic approach to the way it administers the regulatory system to enable it to respond appropriately to new earth resources activities and emerging risks, including improved processes to:
    - identify and monitor emerging issues
    - consistently and comprehensively assess licences, work and operations plans
    - consider the available evidence and clearly document the rationale of decisions.

Recommendations – *continued*

Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed, that the Department of Economic Development, Jobs, Transport & Resources:

6. progresses reforms of Victoria's regulatory system to underpin sustainable unconventional gas activities, specifically focusing on:
    - fully implementing the *National Harmonised Regulatory Framework for Natural Gas from Coal Seams'* 18 leading practices for coal seam gas, and for other types of unconventional gas, where relevant and appropriate
    - reviewing the licence conditions and requirements of work and operations plans to align with the leading practices in the *National Harmonised Regulatory Framework for Natural Gas from Coal Seams* and any other better practices identified through regulatory reform
    - working with the Department of Environment, Land, Water and Planning, to address the gaps, inadequacies and unclear roles and responsibilities within the regulatory system, to better manage the impacts and challenges related to water resources
7. in consultation with stakeholders, develops an industry-wide code of practice for the exploration, production, and impact management of unconventional gas activities that specifically includes requirements for best practice in:
    - information disclosure
    - well integrity
    - hydraulic fracturing activities
    - produced water
    - fugitive emissions
    - well decommissioning and rehabilitation obligations
    - baseline and ongoing monitoring
    - performance assurance.

4 The way forward

At a glance

Background

Improved strategic and transparent risk-based decision-making around the planning, management and regulation of earth resources, including unconventional gas, can benefit all stakeholders. It can provide greater confidence and security for industry and the community and improve trust and confidence in the regulator.

Conclusion

Strategic and transparent risk-based planning, management and regulation of unconventional gas activities needs to improve. This can be achieved through the early identification of regions that can sustainably support an industry, mandatory risk-based impact assessment and approval processes, proactive information disclosure and improved and earlier community engagement.

Findings

- Strategic assessment processes to assess the sustainability of earth resource regions are currently inadequate.
- Information packages released prior to inviting tenders for exploration contain inadequate information.
- The current regulatory system does not allow for the comprehensive assessment of the environmental and social cumulative impacts of projects, and does not provide fair and just rights for all affected parties.
- The community is not engaged early or adequately throughout the life cycle of a project.
- The regulatory system contains significant ministerial discretion that hinders transparent decision-making.

Recommendations

That the departments assess the sustainability of identified earth resource development regions through regional resource capability assessments and mandated risk-based assessment processes.

4.1 Introduction

Transparent strategic assessment, management and regulation of earth resources, including unconventional gas, should benefit the regulator, the industry and the community. The public has the right to know and access information about unconventional gas activities.

4.2 Conclusion

There is an overall lack of accountability and transparency in many decisions related to approving earth resource activities, including unconventional gas. This can be attributed to the absence of clear and unambiguous information to guide the exercise of significant discretionary decision-making powers made under the regulatory system.

The current assessment processes for identifying regions where unconventional gas exploration should occur are inadequate. The system does not consider the capacity of the region's landscape, values and land uses to accommodate commercial earth resource developments. There is no early consideration of the known environmental, social and economic priorities and values of a region. It also does not allow the transparent risk-based assessment of all potential opportunities and cumulative environmental and social impacts. Proactive information disclosure is not a requirement of the industry. The principle of fair and just rights is not incorporated into the requirements for land access and compensation.

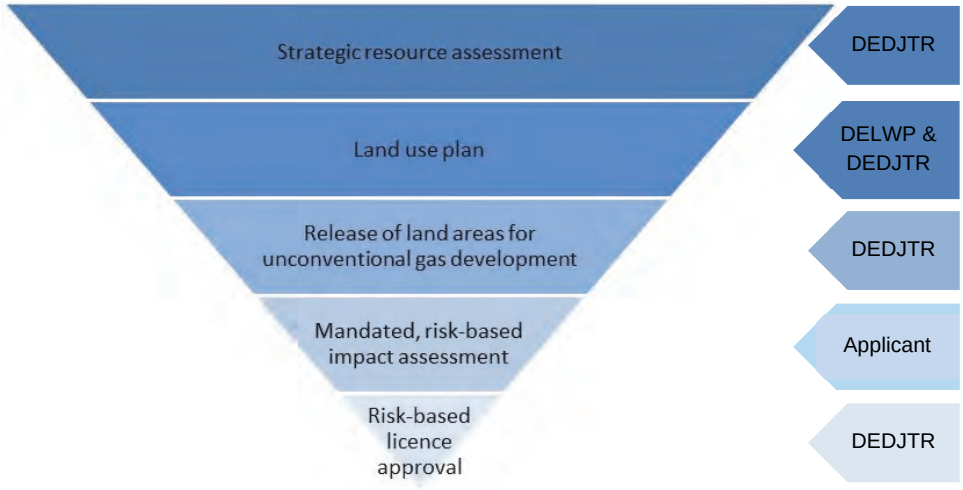
Unless these matters are addressed it will be difficult to build community trust in the regulator and industry if an unconventional gas industry proceeds. There are a range of known better practices that would improve the transparent assessment, management and regulation of unconventional gas activities.

4.3 Key regulatory mechanisms that require a revised approach

This audit has identified a number of steps for providing a sustainable foundation for any future activities should an unconventional gas industry proceed. These are based on the examinations and findings discussed in the previous Parts of this report and a review of the literature on regulating unconventional gas from other jurisdictions.

The first step is reconsidering the way unconventional gas activities are assessed in the context of a region's ability to accommodate such an industry before any exploration activities are approved. A new approach is needed to assess the potential benefits and impacts across a region. This should be followed by a mandatory risk-based impact assessment before any proposal is approved. These steps are reflected in Figure 4A.

Figure 4A
Improved planning and assessment approach for unconventional gas



Source: Victorian Auditor-General's Office.

4.3.1 Strategic resource and land-use planning

One of the Department of Economic Development, Jobs, Transport and Resources' (DEDJTR) key responsibilities is to identify areas for future earth resource development using geoscience data collected at a regional scale. Under the current system there is no requirement to undertake a strategic resource assessment. The objective of such an assessment is to identify areas that offer the highest potential for the occurrence of unconventional gas development through a study of an area's geology. This should be supported by an assessment, using available information, of:

- land use and land values, including biodiversity and vegetation
- water resources
- landscape values
- regionally significant environment, social and economic values that require protection
- sustainable options for land and resource use existence and co-existence, based on a weighting of these values and opportunities.

Exploration proposals do not trigger land-use planning considerations as they do not require planning approval. Production proposals can override planning controls under the current *Mineral Resources (Sustainable Development) Act 1990* (Minerals Act) and the *Petroleum Act 1998* (Petroleum Act).

Such an assessment needs to be undertaken before a decision is made to develop areas with potential unconventional gas resources. It should be undertaken in partnership with DEDJTR, the Department of Environment, Land, Water and Environment (DELWP), other resource managers and the community.

Once a region has been identified as potentially containing unconventional gas through a resource assessment, a land-use plan should be developed before any area is approved for unconventional gas production. Land-use plans are useful tools to define where certain uses and/or activities can take place sustainably, and to determine their impacts on the landscape. The process should examine current and potential land uses and the environment, social and economic values and priorities of an area in order to select and adopt the best land-use options. Its purpose is to select land uses that will best meet the needs of the Victorian community while safeguarding natural resources for the future.

The government has previously undertaken strategic land-use planning exercises to improve the identification of sustainable earth resource development areas. This has been done through the development of tools such as regional growth plans and the *Plan Melbourne* initiative. The objectives of these plans were to:

- identify long-term land use and growth objectives for regions
- support the long-term security of earth resources that are of state significance by identifying and mapping them.

However, the value of using *Plan Melbourne* and the regional growth plans to identify sustainable locations for unconventional gas activities is limited because:

- the scale and location of resources was not known nor recognised as significant
- existing earth resources activities are not consistently identified and considered across plans, nor are potential or existing exploration areas
- the plans do not incorporate current knowledge of landscape capacity and values or the identification of significant surface and subsurface environmental values.

A number of strategic land-use tools are used, or have been proposed, in other jurisdictions. These include:

- strategic land-use policies and plans—New South Wales (NSW)
- regional plans under the *Regional Planning Interests Act 2013*—Queensland.

Their usefulness is predicated on the comprehensiveness of available information about the potential location of the resource. This is currently lacking in Victoria, but should be improved through improved resource assessments.

Department of Economic Development, Jobs, Transport & Resources (DEDJTR) has recognised the need to undertake more detailed resource assessments. It is has identified the preparation of resource capability assessments for priority geological areas. A pilot is underway for copper in the west of the state and developing a new process to do this for the quarrying industry.

Multiple land use

Both the current and proposed land uses within a region should be considered as part of any strategic assessment of sustainable earth resource development regions. This will involve assessing both potential conflicts and opportunities as a result of multiple and sequential land use.

The Council of Australian Governments Energy Council's 2013 *Multiple Land Use Framework* (MLUF) was developed to improve the ability of each state to better manage potential multiple land-use conflicts within a region. The Victorian Government committed to review and draw on the principles of the MLUF, but this review did not occur, and a proposed trial of the framework in the Gippsland Basin by DEDJTR in 2014 was placed on hold, as directed by government.

The MLUF encourages the sustainable use of land for different purposes simultaneously and/or sequentially over time. To achieve this, the MLUF outlines a range of guiding principles including:

- best use of resources
- coexistence
- strategic planning
- tailored participation of communities and landowners
- accessible relevant information.

Any land-use planning exercise undertaken to identify regions for sustainable unconventional gas resource development should incorporate these principles. Our review of regional growth plans for the Gippsland and Otway basins indicated that the plans indirectly refer to some of the MLUF principles. However, they do not outline actions or processes to implement these principles and therefore do not identify how potential multiple land use conflicts could be resolved.

Gas well located in a grazed paddock.

4.3.2 Information packages for release of areas for unconventional gas exploration

Currently, the allocation and approval of unconventional gas exploration rights occur either by an applicant applying to explore an area it has identified for coal seam gas or by DEDJTR releasing areas for tight and shale gas based on regional geological information.

When releasing areas for exploration, DEDJTR provides information packages to those interested in applying. These contain geological information, such as geoscience maps, databases and information systems at a regional scale. Area releases are used to attract and facilitate exploration by private companies through the identification of prospective locations.

The level of pre-competitive information currently supplied by DEDJTR can be improved by including information gathered as a part of any improved resource assessment process in the package. The information should not only include improved geoscience information, but the identification of the key environmental and social values that require protection in the proposed region. This can then be used to inform the level of impact assessment required for each region.

These improvements in the package of information released by DEDJTR will allow for the early and transparent consideration of the key environmental, social and economic values that need to be protected. The current model leaves much of this analysis to the industry proponent.

Other jurisdictions have demonstrated this leading practice by supplying more information about the areas released for exploration. NSW identifies regional and environmental factors that must be assessed as part of any proposal to develop earth resources. This provides:

- more certainty to both industry and the community around the potential prospectivity of the resource
- a better understanding of the environmental, economic and social values that need to be assessed, weighted and protected.

DEDJTR has indicated its willingness to adopt approaches to improve pre-competitive data collection. Its draft 2015 Strategy Resource Planning Framework identifies the concept of tailored geological data packages. This will require more active departmental and interagency participation in collecting data and information about the resource and the environmental, social and economic considerations.

4.3.3 Mandated risk-based impact assessments

Mandated risk-based impact assessments are a vital step in determining the sustainability of any earth resource development—including unconventional gas. Such an assessment should be required before any title right is issued for unconventional gas which allows exploration or production to proceed.

There is currently no comprehensive mandatory risk-based impact assessment process under the regulatory system for unconventional gas proposals:

- Impact assessments under the Minerals Act are currently subject to ministerial discretion. These provisions have never been used by the Minister for Energy and Resources and there are no criteria to guide their use.
- Mandatory referral processes only occur for coal seam gas applications under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the *Environment Effects Act 1978.*

- The Minister of Planning has discretion about whether an environmental impact assessment is required for unconventional gas proposals under the *Environment Effects Act 1978.*
- Guidelines informing these decisions do not contain clear and transparent criteria.

Many better practice approval processes, such as those in NSW and Alberta, Canada, have a mandated referral process to determine what level of impact assessment is required to assess the sustainability of an unconventional gas application.

In NSW, proposals are assessed under the relevant planning Act if they are considered to be a 'state significant project'. Projects assessed as falling outside of the criteria used to define this, are reviewed by the regulator against a set of predetermined localised environmental risk factors to determine the level of mandated impact assessment required. This can take the form of a higher level of assessment through to the standard approval assessment process based on localised risks.

A similar better practice model using the same gated principles as NSW process should be implemented in Victoria. All unconventional gas proposals should be referred for consideration under the *Environment Effects Act 1978*. Where the Minister for Planning determines that the project is not of regional or state significance and therefore an environmental impact assessment is not required, a mandated risk-based impact assessment process should be a requirement under the relevant earth resources Act. The aim of this assessment should be to assess localised risks and impacts.

The current standard licensing and approval system administered by DEDJTR is not adequately risk based. Assessment and approval are aligned with the stages in the development of the resource—exploration, retention and production—rather than the risks posed by particular activities. Consequently, the level of environmental assessment obligations tend to increase across the stages, based on the premise that exploration activities generally represent a lower scale of risk than production activities.

In addition, the level of rigour and oversight applied to exploration activities by DEDJTR is not proportional to the severity of the risk. Exploration under the Minerals Act does not require the development and approval of an environmental management plan, only a works plan which can authorise a number of activities. The incorporation of environmental management considerations into a works plan is dependent upon ministerial discretion. This process lacks transparency as there are no published criteria on how this decision is to be made.

Environmental management requirements under the Minerals Act are not as comprehensively risk based as the Petroleum Act requirements. While the requirements for tight and shale gas are more risk based under the Petroleum Act, they still do not comprehensively address the potential scale of risks associated with tight and shale gas activities, including hydraulic fracturing and water management. Amendments made to the Minerals Act in November 2014 require DEDJTR to develop risk-based and outcome-focused work plans by early 2016. This needs to be supported by a risk-based licensing approval process.

Approvals are undertaken on a project-by-project basis. This does not adequately take into account the cumulative environmental and social impacts of a resource use proposal to a region or the cumulative impacts of all resource use within a region. Assessments need to take the cumulative environmental and social impacts of earth resource development proposals into account. The regulatory system inadequately addresses underground impacts and does not incorporate specific requirements for social impact assessments.

Cumulative social impacts are particularly significant to a region. Individually, one earth resources development project might bring economic benefits to a region, and the impact on the environment, the liveability of a region, its infrastructure and services is able to be accommodated. However, cumulatively, resource developments can have a serious impact on a region and neighbouring regions. This can occur directly through increased traffic movements, noise, dust and visual impacts, and indirectly through a change in the local population and dynamics.

4.3.4 Resource regulation models

One of the terms of reference for the current 2015 Parliamentary *Inquiry into Unconventional Gas in Victoria* is to identify any further scientific work needed to inform the effective regulation of an onshore unconventional gas industry.

A number of better practice approaches have been identified to improve the regulation of earth resources across a region. One approach is to regulate these resources at a sedimentary basin level. The majority of Victoria's natural resources—including unconventional gas—reside within sedimentary basins. The *Sedimentary Basin Management Initiative* developed by the Carlton Connect Initiative, Melbourne University proposes better practice regulation should be designed to manage the specific risks and values within a sedimentary basin. The subsurface resources of a geological formation known as a basin—such as gas and groundwater—are held in the spaces between the basin's sedimentary rocks and are crucial to economic and agricultural productivity, energy needs, and the maintenance of ecosystems.

Another approach would be to use Alberta's 'play-based' regulatory model. This approach, currently being piloted, defines regions as 'plays'. A resource play is an accumulation of hydrocarbons over a large area beneath the surface of the ground. Its geology and geographic setting define the characteristics of the play and how it is likely to be developed. Through play-based regulation, energy development rules and processes are designed to suit the risks associated with the specific resource play.

These two approaches allow for the comprehensive assessment of all specific risks and impacts of unconventional gas developments across large geographical plays or basins—to both above and below ground resources and values. These models allow for an assessment of the capacity of the play or basin to accommodate new single or mixed and sequential land and resource use while taking into account the cumulative environmental, social and economic impacts.

Such approaches require interdisciplinary research and collaborative partnerships across sectors, and between industry, government and academia, to collect, collate and analyse all data into a play-based or sedimentary basin model.

4.3.5 Improved community involvement

The community should have an opportunity to participate in and influence decision-making processes around sustainable earth resource development regions. The community also needs to be engaged with and informed about how risks will be managed under individual proposals, and about how appropriate compensation provisions will be determined.

Community consultation for earth resources projects, including unconventional gas, is inadequate under the existing regulatory system. The Minerals Act imposes a duty on the proponent to consult the community but does not require any community consultation to be carried out prior to a title for exploration being issued. This means that the community consultation process does not involve obtaining feedback about the community's economic, environmental and social priorities. Rather, current requirements involve the delivery of information regarding the nature of operations to be conducted under a title that has already been approved. This can have a disengaging effect upon the community.

Landowners protest against mining.

The Petroleum Act does not have any community consultation obligations corresponding to those in the Minerals Act. This means shale and tight gas proposals are not subject to any mandatory community consultations at any point. The Petroleum Act regulations require an environmental management plan to report on any consultations that occur, but there is no obligation to consult.

Community consultation is a particularly crucial component for the identification of sustainable areas because of the potential impact earth resource activities will have on the landscape and liveability of a region.

DEDJTR has acknowledged that further work is required in this area. In its draft 2015 *Strategy Resource Planning Framework* it has identified a new approach to engaging with local and regional communities and improving industry engagement practices. It is applying this approach to a region of the state it intends to release for mineral exploration. Any improved approach should incorporate the better practice principles for engaging with communities that have been identified in a range documents, including VAGO's 2015 better practice guide on *Public Participation in Government Decision-making.*

The outcome of the recent NSW Supreme court decision—Metgasco Limited v Minister for Resources and Energy—should inform any review of community engagement. The decision identified that the objective of community consultation is not persuasion, but rather the involvement of the community in proposals that will affect their environment and landscape. It determined that consultation should be required across the life of a project, with flexible requirements to address the spectrum of risks experienced by stakeholders. The community should have the ability to comment on and influence decisions about regions being released for tender. Once the project is up and running the key objective of engagement should be to inform and share information.

To achieve best practice, community engagement processes should be disconnected from the staged licensing and approval processes. Social concerns and risks are generally highest at the project concept stage and therefore must be addressed comprehensively as early as possible.

4.3.6 Fair and just rights for landowners

The principle of fairness promotes proportionate outcomes for all stakeholders impacted directly or indirectly by unconventional gas projects. All parties should be appropriately catered for under a revised regulatory system. Land access and compensation should focus on impacted owners and neighbours directly impacted, and royalty programs—where they exist—should include communities that are indirectly impacted.

Land access

Rights to access land for the purposes of resource exploration vary by jurisdiction. No jurisdiction grants land owners an absolute right to exclude an industry title holder access to their land. All states do, however, contain exemption areas. These are generally defined by proximity to dwellings or structures. Western Australian legislation, however, contains a much broader list of exemptions which includes ‘land under cultivation for agricultural purposes'.

In Victoria, the regulatory system requires the written consent of the landowner in order for industry to access their land for exploratory purposes. However, where the landowner refuses consent the Victorian Civil and Administrative Tribunal (VCAT) can make a compensation determination at the request of the industry proponent. If a compensation determination is made, this then allows access even though the landowner has not consented. On the surface, therefore, there is no compelling incentive for the industry to engage in serious negotiations with landowners. In practice however, disputes have generally been settled in Victoria through the Victorian Mining Warden rather than VCAT.

The existing system creates uncertainty for the landowner given their land may be subject to an exploration or development permit at any time. The system also creates an inequity in the bargaining powers of the landowner and the industry, given VCAT can make a determination about access to land.

The Queensland regulatory system is more advanced in ensuring fair outcomes in relation to land access. It achieves this through its *Land Access Policy Framework* and a land access code of practice, with mandated access and compensation agreements. The framework is given force through legislation, including compliance and enforcement provisions for breaches of the code. Victoria should consider such a model.

Other jurisdictions are also considering the potential implications that horizontal drilling may have for underground access rights, as this type of drilling can extend beneath multiple properties.

Compensation

The current compensation arrangements in Victorian legislation are inadequate. There are several limitations in the existing provisions:

- Compensation amounts payable to affected land owners are less than those of other jurisdictions.
- Compensation provisions relate to above ground impacts only, and do not consider underground impacts.
- Local communities exposed to impacts have no ability to claim any form of compensation.
- There are time limits in applying for compensation, but the impacts from unconventional gas activities may not be seen for many years due to cumulative impacts over time.

The Earth Resources Ministerial Advisory Council has identified that both land access and compensation requirements in Victoria are inadequate and require amendment. It provided a set of best practice principles—including increasing the upper limit on compensation to landowners. DEDJTR developed a project plan for how these principles may be met for the minister's endorsement. This plan was to consider not only improved land access and compensation arrangements, but also to review the role and function of the Victorian Mining Warden in terms of dispute resolution. This work is due to be completed in August 2015, but this appears unlikely as the plan is yet to be endorsed.

Victoria currently has no regulatory mechanism to compensate local communities who may be indirectly impacted by unconventional gas activities. Western Australian and Queensland governments have implemented programs that set aside funds to support local communities impacted by mining and petroleum production activities. In Western Australia, the Royalties for Regions Fund sets aside 25 per cent of the state's mining and onshore petroleum royalty revenue to be reinvested in regional areas. This process is managed by local government. The Queensland Royalties for Regions scheme initially set aside $495 million of state royalties to be reinvested over a four-year period, commencing in 2012, with an ongoing commitment thereafter of $200 million each year. Funding is allocated to eligible local councils, based on a competitive process, to help communities experiencing negative impacts from large scale gas developments.

A transparent royalty program promoting the redistribution of profits back into the community improves community engagement and enhances social acceptance of the impacts created by earth resource activities.

4.3.7 Proactive information disclosure

A number of jurisdictions have mandated information disclosure conditions covering the environmental performance of an industry, the use of fracking chemicals and the chemical's toxicity. This is not the case in Victoria. The current regulatory system does not support proactive information disclosure by the industry or information sharing among key stakeholders. Licensees are not required to:

- inform the community or provide public access to information on their environmental performance
- publically report on compliance with licence requirements
- publish the locations of wells.

In contrast, the environmental performance of landfill licensees in Victoria is made public under the requirements of the *Environment Protection Act 1970,* as are the locations of contaminated sites. This information is all publically available on the Environment Protection Authority's (EPA) website.

Proactive information disclosure is crucial to drive improved environmental performance and community trust. Requiring companies to disclose performance can encourage behavioural change and better performance, to avoid adverse publicity or poor social acceptance. EPA's information disclosure requirements for landfill operators were considered better practice in VAGO's 2014 *Managing Landfills* audit. All landfill operators are required to submit and publish annual licence performance statements, which make their compliance against each licence condition public. These performance statements are used by landfill operators to demonstrate their commitment to managing risk and complying with their responsibilities to EPA and the public. EPA audits the accuracy of selected performance statements annually.

The NSW and Queensland regulatory systems require operators to submit a complete list of fracking chemicals to state regulators for approval—along with their volumes, concentrations, and potential toxicity—prior to gaining approval for hydraulic fracturing. These systems also encourage full and voluntary public disclosure of all plans relating to coal seam gas activities, well operation management plans, and environment management plans.

A revised Victorian regulatory system should ensure proactive information disclosure requirements are included around environmental performance, including the use of hydraulic fracturing chemicals and location of abandoned wells.

4.3.8 Discretionary decision-making

Victoria's regulatory system has significant ministerial discretionary powers in relation to:

- exempting land from earth resource activities
- assessing the need for an environmental impact assessment
- granting, approving and imposing conditions on licences and work plans, programs and operation plans
- the cost of rehabilitation bonds.

A review of the NSW regulatory system for gas by the NSW Independent Commission against Corruption in 2012 identified that too much ministerial discretion enabled an abuse of powers and corruption, and was at odds with the principles of administrative law.

The current regulatory system needs to be amended to improve accountability and transparency in decision-making in relation to the assessment of environmental and social impacts for earth resource development, including unconventional gas activities. The decision about whether an environmental impact assessment is needed is at the discretion of the Minister for Planning. The referral of CSG projects to the minister should be supported by clearer decision criteria and extended to shale and tight gas development.

There are very few criteria and clear guidance materials available to assist the Minister for Energy and Resources, or their delegate, to determine the extent and level of impact assessment required under the relevant earth resources Acts for unconventional gas activities.

Decision-makers under earth resources Acts are not always required to provide their reasons, and the ability to have these decisions reviewed is limited.

The use of discretion should be informed by clear guidance material with more definitive decision criteria, less ambiguous wording and firm time lines. In addition the requirement to communicate the reasons for decisions should be mandated—particularly where they are adverse to the applicant—and made public. Decisions should be subjected to appropriate review mechanisms—currently they are not.

The use of discretionary powers within the current regulatory system needs to be reviewed in light of contemporary better practice approaches to ensure they are exercised appropriately and transparently.

Recommendations

Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed, that the Department of Economic Development, Jobs, Transport & Resources:

8. improves the amount of detail included in the pre-competitive information packages accompanying any release of land for exploration through a more comprehensive resource assessment process
9. reviews the land access and compensation provisions of the regulatory system in line with best practice requirements from other jurisdictions
10. develops options for consideration by the Minister for Energy and Resources regarding the feasibility of models to compensate impacted communities, such as the Royalties for Regions schemes in Western Australia and Queensland
11. reviews community consultation requirements in the regulatory system to ensure they address the spectrum of social risks and impacts across the lifecycle of resource development rather than being aligned to the licensing and approval stages
12. reviews best practice proactive information disclosure requirements for inclusion in the regulatory system.

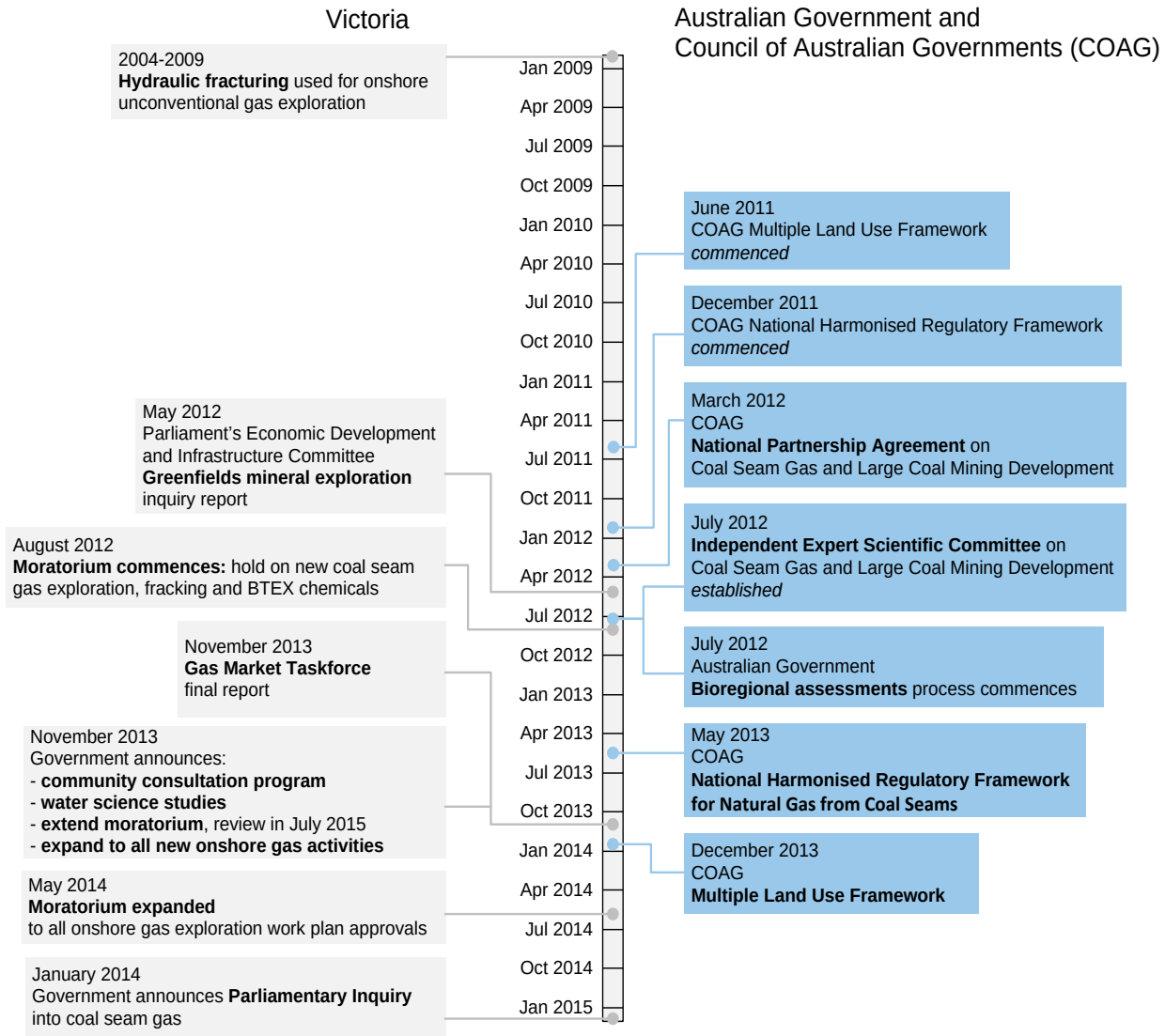
Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed, that the Department of Environment, Land, Water and Planning, in consultation with the Department of Economic Development, Jobs, Transport & Resources:

13. develops a land-use plan to determine the sustainability of an area for the extraction of unconventional gas prior to any licence being issued
14. reviews models to implement a mandated impact assessment process under the *Environment Effects Act 1978* and the relevant earth resources Act/s.

Appendix A.

Time line of unconventional gas events

Figure A1
Unconventional gas events in Victoria and across Australia



Source: Victorian Auditor-General's Office.

Appendix B.
Glossary

Terms used in this report

Aftercare—managing the environmental risks that can continue to be present at unconventional gas sites for a significant period of time after activities have ceased, through works, maintenance, monitoring and reporting.

Aquifer—a naturally occurring underground source of water that is held in porous rock structures, making it easy to extract.

Conventional gas—underground source of natural gas found trapped and concentrated within 'conventional', porous rock layers like sandstone and limestone.

Decommissioning or abandonment—removing and appropriately disposing of gas equipment and facilities at the end of their operating life and rehabilitating any disturbed areas.

Exploration—searching for earth resources, using activities such as surveys, drilling, sampling, extracting and testing.

Flow back water—water that is returned to the surface after hydraulic fracturing and can contain hydraulic fracturing fluids, mixed with groundwater and any naturally occurring contaminants it contains**.**

Fugitive emissions—gas that leaks into the atmosphere from well structures and from cracks and other pathways through the surrounding land as a result of underground activities such as drilling and fracking.

Groundwater—water found below the earth's surface.

Hydraulic fracturing or 'fracking'—pumping liquid, which can be water or a mixture of water and chemicals, and sand into a gas well under high pressure to fracture the surrounding rock and release the gas.

Hydrogeology—the distribution and movement of groundwater in aquifers.

Licence—generic term referring to any licence, lease or permit granted for earth resources development across the three stages of exploration, retention or production.

Natural gas—a naturally occurring gas found underground and composed primarily of methane gas, and used as an energy source.

Produced water—underground water that is brought to the surface by the process of extracting the gas.

Production—commercial extraction of earth resources, referred to as mining under the *Mineral Resources (Sustainable Development) Act 1990* or production under the *Petroleum Act 1998.*

Region—an area of land of varying size with boundaries defined by one or a range of factors, such as the boundaries of the resource, the sedimentary basin or natural resource catchment boundaries**.**

Risk and impact—risk is the chance of something happening that will have an undesired impact and is measured by assessing the likelihood of the undesired impact arising and the likely consequence or seriousness of that undesired impact.

Subsidence—a downward shift in the Earth's surface.

Rehabilitation—restoring the environment where unconventional gas activities have caused disturbance, above or below ground, by returning the site to its former form or a new form; this should be planned from the outset and occur progressively during the operational life of the site.

Retention—an intermediate licensing stage between the exploration and production stages, which is used to demonstrate the economic viability of commercial production through activities such as intensive exploration and research and development.

Sedimentary basin—region of the earth where a depression has been filled with sediments over long time scales, forming sedimentary rocks that have small pores or spaces within them which provide resources such as gas, water, heat and storage capacity and also support above ground ecosystems.

Seismic activity—movement of the earth, including the occurrence or frequency of earth tremors and earthquakes.

Unconventional gas—underground sources of natural gas that are found in three types of 'unconventional' rock layers known as coal seams, tight rocks and shale rocks, and referred to as coal seam gas, tight gas and shale gas.

Well—hole drilled underground to explore for or extract gas, and lined with steel and cement casings to stop anything leaking out of or into the well from the different rock layers that the well penetrates—referred to as a drill hole under the *Mineral Resources (Sustainable Development) Act 1990* and a gas well under the *Petroleum Act 1998.*

Well integrity—the structures and processes used to make sure there are no leaks into or out of a well.

Work plan—describes the on-site works subsequent rehabilitation associated with an activity or project that the licensee plans to conduct under a licence, also known as an operations plan under the *Petroleum Act 1998.*

Appendix C.

Gaps in Victoria's regulatory system

Figure C1
Detailed assessment of Victoria's regulatory system against better practice principles and approaches for regulating unconventional gas activities

Best practice principles and practices	Coal seam gas regulatory system	Tight and shale gas regulatory system	Examples of better practice in other jurisdictions
Principles			
Transparency	High degree of ministerial discretion in decision-making without transparent criteria No clear road map of obligations	High degree of ministerial discretion in decision-making without transparent criteria. No clear road map of obligations	South Australia—Roadmap process
Community involvement	Consultation provisions inadequate—no consultation prior to areas being released for exploration	Consultation provisions inadequate—no consultation prior to areas being released for exploration	
Appropriate siting—including multiple land-use conflicts	Legislation does not incorporate strategic planning mechanisms at exploration and retention stages Poor consideration to multiple land-use issues	Act does not incorporate strategic planning mechanisms at exploration and production stages. No consideration of multiple land use	New South Wales (NSW)—strategic land use policies and plans Queensland (QLD)—regional plans under the *Regional Planning Interests Act 2014* Play based plans—Alberta, Canada Sedimentary basin strategy—Melbourne University Victoria
Comprehensive impact assessment	No mandated environmental impact assessment process	No mandated environmental impact assessment process. Staged approval process not risk based. No clear trigger for referral under the *Environment Effects Act 1978* or the *Environment Protection and Biodiversity Conservation Act 1999*	NSW—Gateway process Alberta—environmental impact assessment process

Figure C1
Detailed assessment of Victoria's regulatory system against better practice principles and approaches for regulating unconventional gas activities – *continued*

Best practice elements and principles	Coal seam gas regulatory system	Tight and shale gas regulatory system	Examples of better practice in other jurisdictions
Principles – *continued*			
Comprehensive environmental management plans and guidelines	Does not specifically address coal seam gas risks—fracking, well integrity, produced water No specific requirement for an environmental management plan at exploration stage	Do not specifically address hydraulic fracturing and well integrity beyond conventional gas well issues and requirements	NSW—Code of Practice for Exploration of Coal Seam Gas (draft)
Apply a hierarchy of risk control measures to all aspects of the project	Staged approval process, not risk based on activities	Staged approval process, not risk based on activities	Alberta regulatory system
Verify key system elements, including well design, water management and hydraulic fracturing processes, by a suitably qualified and authorised person	No requirement for qualified third party verification of key system elements, including well design, construction and operation	No requirement for qualified third party verification of key system elements, including well design, construction and operation	NSW—Code of practice for coal seam gas well integrity QLD—Code of practice for constructing and abandoning coal seam gas wells QLD—Land Access Code
Require proactive information disclosure requirements	Discretionary information disclosure requirements only	Discretionary information disclosure requirements only	Environment Protection Authority (EPA) Works Approval requires full disclosure NSW and QLD full disclosure requirements for risks, risk management and fracking chemicals
Practices			
Land exemption—agricultural land, including multiple land use conflicts	Does not require balanced consideration of all factors	Power to exempt land after balanced consideration, but provision has never been used	NSW—strategic land use policies and plans QLD—regional plans under the *Regional Planning Interests Act 2014*
Land access	Access can be enforced by judicial system. No specified best practices for exercise of access entitlements	Access can be enforced by judicial system. No specified best practices for exercise of access entitlements	QLD—Land access regulated through the Land Access Code which, imposes mandatory conditions on the conduct of authorised activities on private land

Figure C1
Detailed assessment of Victoria's regulatory system against better practice principles and approaches for regulating unconventional gas activities – *continued*

Best practice elements and principles	Coal seam gas regulatory system	Tight and shale gas regulatory system	Examples of better practice in other jurisdictions
Practices – *continued*			
Fair compensation process and outcomes	Maximum compensation amounts inadequate No negotiation and compensation agreement framework outlining best practices	Maximum compensation amounts inadequate No negotiation and compensation agreement framework outlining best practices	QLD—Land Access Code
Management of cumulative impacts	No requirement to assess cumulative impacts Approval on a case by case basis	No requirement to assess cumulative impacts Approval on a case by case basis	*Environment Protection and Biodiversity Conservation Act 1999* Alberta—play based approvals QLD—declaration of cumulative underground water impact regions Sedimentary basin strategy—Melbourne University Victoria
Application of best practice to design, construction, operation, maintenance and decommissioning of wells	No code of practice for well integrity	No code of practice for well integrity	NSW—Code of Practice for Well Integrity QLD—Code of Practice for Constructing and Abandoning Coal Seam Gas Wells
Require independent supervision of well construction	No explicit requirement for independent supervision of well construction	No explicit requirement for independent supervision of well construction	NSW—Code of Practice for Coal Seam Gas Fracture Stimulation QLD—Code of Practice for Constructing and Abandoning Coal Seam Gas Wells
Require best practice hydraulic fracturing processes	There are currently no specific requirements or guidance related to hydraulic fracturing	There are currently no specific requirements or guidance related to hydraulic fracturing	NSW—Code of Practice for Coal Seam Gas Fracture Stimulation
Ensure baseline studies and ongoing monitoring for vulnerable water resources	Baseline monitoring requirements not comprehensive	Baseline monitoring requirements not comprehensive	QLD—Underground water management legislative framework NSW—Aquifer Interference Policy

Figure C1
Detailed assessment of Victoria's regulatory system against better practice principles and approaches for regulating unconventional gas activities – *continued*

Best practice elements and principles	Coal seam gas regulatory system	Tight and shale gas regulatory system	Examples of better practice in other jurisdictions
Practices – *continued*			
Management of produced water	No guidelines or requirement to develop a water management strategy for the life cycle of the operation Currently significant foverlap and a lack of clarity around produced water management within and between the *Mineral Resources (Sustainable Development) Act 1990,* the *Water Act 1989* and the *Environment Protection Act 1970*	No guidelines or requirement to develop a water management strategy for the life cycle of the operation Currently significant overlap and a lack of clarity around produced water management within and between the *Mineral Resources (Sustainable Development) Act 1990,* the *Water Act 1989* and the *Environment Protection Act 1970*	Western Australia—Water in Mining Guideline QLD—Coal Seam Gas Water Management Policy NSW—Code of Practice for Coal Seam Gas Fracture Stimulation NSW banned the use of evaporation ponds
Fugitive emissions management	No specific requirements	No specific requirements	QLD—Code of Practice for Coal Seam Gas Well Head Emissions Detection and Reporting
Fair compensation process and outcomes	Maximum compensation amounts inadequate No negotiation and compensation agreement framework outlining best practices	Maximum compensation amounts inadequate No negotiation and compensation agreement framework outlining best practices	QLD—Land Access Code
Make-good provisions	No make-good provisions	No make-good provisions	QLD and WA Regional Royalties Funds QLD—Mandated 'make-good' agreement for well impacts
Independent qualified oversight of monitoring and environmental management plan implementation and reporting	No mandated qualified independent auditing or oversight of environmental performance requirements	No mandated qualified independent auditing or oversight of environmental performance requirements	EPA Landfill Licensing Framework

Source: Victorian Auditor-General's Office.

Appendix D.

Audit Act 1994 section 16—submissions and comments

Introduction

In accordance with section 16(3) of the *Audit Act 1994*, a copy of this report, or part of this report, was provided to the Department of Economic Development, Jobs, Transport & Resources and the Department of Environment, Land, Water and Planning.

The submissions and comments provided are not subject to audit nor the evidentiary standards required to reach an audit conclusion. Responsibility for the accuracy, fairness and balance of those comments rests solely with the agency head.

Responses were received as follows:

RESPONSE provided by the Acting Secretary, Department of Economic Development, Jobs, Transport & Resources

Department of Economic Development, Jobs, Transport & Resources

GPO Box 4509
Melbourne Victoria 3001 Australia
Telephone: 03 9208 3333
www.economicdevelopment.vic.gov.au
DX 210074

Ref: D2015/35110

Mr John Doyle
Victorian Auditor-General
VAGO
Level 24, 35 Collins St
MELBOURNE VIC 3000

Dear Mr ~~Doyle~~ John

DEPARTMENT'S RESPONSE TO VAGO'S PROPOSED PERFORMANCE AUDIT REPORT 'UNCONVENTIONAL GAS: MANAGING RISKS AND IMPACTS': MANAGING RISKS AND IMPACTS

Thank you for your letter of 29 July 2015 inviting a submission in response to your proposed performance audit report prior to its tabling in Parliament and public release.

I note that your audit report recommends the implementation of a range of policy, planning and legislative approaches, if exploration and development of onshore unconventional gas is to proceed in Victoria.

I am mindful that the Environment and Planning Committee of the Legislative Council is currently conducting an inquiry into onshore unconventional gas in Victoria, which is due to present its final report by 1 December 2015. The Terms of Reference for the inquiry includes provision for the Parliamentary Committee to consider your audit report.

Within this context, I accept Recommendation 1 of your report to prepare a risk based strategy to inform the government's review of the moratorium and subsequent decision about whether or not an unconventional gas industry should proceed in Victoria. This would build on the work of the onshore natural gas water science studies and the implementation of the Government response to the Hazelwood mine fire inquiry, specifically Recommendation 4 of that report to bring forward the introduction of risk-based work plans.

Recommendation 2, and Recommendations 6 through 14, relate to issues that are likely to be included in the Victorian Government's response to the inquiry. Similarly, your Recommendation 3 presents a range of legislative reforms that would require coordination by the Victorian Government and potentially the Parliament. Once the Inquiry is complete and the Government response is delivered, Departmental officers would seek to engage with your office to confirm further follow-up actions.

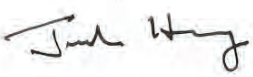
State Government Victoria

RESPONSE provided by the Acting Secretary, Department of Economic Development, Jobs, Transport & Resources – continued

Regarding Recommendations 4 and 5, I reaffirm that the department is progressing action in response to the VAGO's previous audit: *Effectiveness of Compliance Activities: Departments of Primary Industries and Sustainability and Environment*. The Department of Primary Industries, the Department of Sustainability and Environment and their successor Department of Environment and Primary Industries introduced significant reforms to their regulatory practice following the 2012 audit. With the creation of the new Department of Economic Development, Jobs, Transport and Resources, this reform is continuing and Earth Resources Regulation is now incorporated into the regulatory practice reform agenda.

Thank you for the opportunity to provide this submission.

Yours sincerely



Justin Hanney
Acting Secretary

Date: 11 / 9 /2015

RESPONSE provided by the Secretary, Department of Environment, Land, Water and Planning

Department of Environment
Land, Water & Planning

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Ref: SEC011345

RECEIVED
13 AUG 2015
VICTORIAN AUDITOR-GENERAL'S OFFICE

Mr John Doyle
Auditor-General
Level 24, 35 Collins Street
MELBOURNE VIC 3000

Dear Mr Doyle John,

PERFORMANCE AUDIT - UNCONVENTIONAL GAS : MANAGING RISKS AND IMPACTS

Thank you for your letter of 29 July 2015 inviting submissions for inclusion in your proposed performance audit report *Unconventional Gas: Managing Risks and Impacts*, which is scheduled to be tabled in parliament on 19 August 2015.

The Department of Environment, Land, Water and Planning (DELWP) notes the findings and the recommendations of the audit and provides the enclosed action plan to address those recommendations relevant to DELWP.

The enclosed action plan is subject to the Victorian Government's response to the outcomes of the current parliamentary inquiry into onshore unconventional gas in Victoria.

DELWP will work with the Department of Economic Development, Jobs, Transport and Resources where the two departments are jointly responsible, to constructively address the recommendations.

Thank you for your office's work on this issue, and for the opportunity to consider your proposed recommendations.

Yours sincerely

Adam Fennessy
Secretary

13 AUG 2015

State Government Victoria

RESPONSE provided by the Secretary, Department of Environment, Land, Water and Planning – continued

Department of Environment, Land, Water and Planning
Action plan to address recommendations for *Unconventional Gas: Managing Risks and Impacts* audit report

Report Recommendation	DELWP proposed actions	Completion Date
To inform the government's review of the moratorium and subsequent decision about whether or not an unconventional gas industry should proceed in Victoria. **Recommendation 1** That the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), in partnership with the Department of Environment, Land, Water and Planning (DELWP): 1. develops a risk-based strategy which: • identifies known and potential risks to water, air, land and the community associated with the development of an unconventional gas resource using available information and data and the input of relevant agencies as needed. • prioritises the actions that would need to be taken for an unconventional gas industry to proceed and identifies roles and responsibilities for these.	In the area of water resource management DELWP will contribute to DEDJTR's development of a risk-based strategy which: • identifies known and potential risks to water, air, land and the community associated with the development of an unconventional gas resource using available information and data and the input of relevant agencies as needed • prioritises the actions that would need to be taken for an unconventional gas industry to proceed and identifies roles and responsibilities for these.	To be confirmed following the release of the Government response to the parliamentary inquiry in to onshore unconventional gas in Victoria.
Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed - That DEDJTR: **Recommendation 6:** 6. progresses reforms of Victoria's regulatory system to underpin sustainable unconventional gas activities, specifically focussing on: • fully implementing the *National Harmonised Regulatory Framework for National Gas from Coal Seams*' 18 leading practices for coal seam gas and for other types of unconventional gas, where relevant and appropriate • reviewing the licence conditions and requirements of work and operations plans to align with the leading practices in the *National Harmonised Regulatory Framework for National Gas from Coal Seams* and any other better practices identifies through regulatory reform • working with DELWP, to address the gaps, inadequacies and unclear roles and responsibilities within the regulatory system, to better manage the impacts and challenges related to water resources.	Should the moratorium be lifted, DELWP will clarify the requirements of the *Water Act 1989* and associated instruments in relation to unconventional gas activities including through the preparation of guidance material such as process maps. This will be done in consultation with DEDJTR.	To be determined should the moratorium be lifted.

1

RESPONSE provided by the Secretary, Department of Environment, Land, Water and Planning – continued

Department of Environment, Land, Water and Planning
Action plan to address recommendations for *Unconventional Gas: Managing Risks and Impacts* audit report

Report Recommendation	DELWP proposed actions	Completion Date
Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed – That DELWP in consultation with DEDJTR: **Recommendation 13** Develops a land use plan to determine the sustainability of an area for the extraction of unconventional gas prior to any licence being issued.	Should the moratorium be lifted, DELWP will, in consultation with DEDJTR, prepare options for consideration by the government. In the interim, DELWP will examine appropriate regional land use planning processes that could be utilised for determining the sustainability of an area for the extraction of unconventional gas prior to any licence being issued. This includes use of existing land use planning mechanisms or alternative approaches applied in other jurisdictions.	To be determined should the moratorium be lifted.
Should the moratorium be lifted and unconventional gas exploration and development be allowed to proceed – That DELWP in consultation with DEDJTR: **Recommendation 14** Reviews models to implement a mandated impact assessment process under the *Environment Effects Act 1978* and the relevant earth resources Act/s.	Should the moratorium be lifted and following the release of the government response to the parliamentary inquiry, DELWP will, in consultation with DEDJTR, • review options to mandate an assessment process under the *Environment Effects Act 1978* for unconventional gas developments, and initiate appropriate statutory proposals for consideration by the Victorian Government • examine opportunities to amend the 'Ministerial Guidelines for Assessment of Environmental Effects' to improve the clarity and transparency of assessment criteria • design any changes to ensure coordination and alignment of processes under the *Environment Effects Act 1978* with impact assessment requirements under relevant earth resources legislation.	To be determined should the moratorium be lifted.

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Auditor-General's reports tabled during 2015–16

Report title	Date tabled
Follow up of Collections Management in Cultural Agencies (2015–16:1)	August 2015
Follow up of Managing Major Projects (2015–16:2)	August 2015
Follow up of Management of Staff Occupational Health and Safety in Schools (2015–16:3)	August 2015
Biosecurity: Livestock (2015–16:4)	August 2015
Applying the High Value High Risk Process to Unsolicited Proposals (2015–16:5)	August 2015

Further information

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