



Rail Safety National Law  
Fatigue Risk Management – Hours of Work and Rest  
Draft Regulatory Impact Statement  
February 2012



National Transport Commission

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**Rail Safety National Law:**

**Fatigue Risk Management – Hours of Work and Rest – Draft Regulatory Impact Statement**

Report Prepared by: National Transport Commission

# Report outline

<b>Title:</b>	Rail Safety National Law: Fatigue Risk Management – Hours of Work and Rest
<b>Type of report:</b>	Draft regulatory impact statement
<b>Purpose:</b>	Public comment
<b>Abstract:</b>	<p>In December 2009, the Council of Australian Governments agreed to implement a single national rail safety regulator. It was also agreed that a rail safety national law be developed, which the Regulator will administer, and that the law would be based on the National Transport Commission Model Rail Safety Bill (2007) and Regulations. The National Law was to address areas where states and territories had varied from the Model Law, including in the area of fatigue risk management. A previous regulatory impact statement has assessed the impact of the National Law including some fatigue risk management requirements; however, the issue of whether the law should further regulate and place limits around hours of work and rest for rail safety workers remained outstanding. This draft regulatory impact statement assesses the options available for the further regulation of hours of work and rest for rail safety workers.</p>
<b>Submission details:</b>	<p>Submissions will be accepted until 21 March 2012 online at <a href="http://www.ntc.gov.au">www.ntc.gov.au</a> or by mail to:</p> <p>Chief Executive Officer National Transport Commission L15/628 Bourke Street MELBOURNE VIC 3000</p>
<b>Key milestones:</b>	<p>Submission of this draft regulatory impact statement for public comment for the period from 27 February to 21 March 2012. Submission of the final regulatory impact statement to the Standing Council of Transport and Infrastructure in May 2012.</p>
<b>Key words:</b>	<p>Rail safety, rail safety worker, rail transport operators, rail infrastructure manager, regulatory impact statement, fatigue, fatigue risk management, hours of work, hours of rest, safety net</p>
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# How to make a submission to the NTC

## Who can make a submission?

Any individual or organisation can make a submission to the NTC.

## How to submit

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Alternatively, you can mail your comments to: Chief Executive Officer, National Transport Commission, Level 15/628 Bourke Street, MELBOURNE VIC 3000.

Where possible, you should provide evidence, such as data and documentation, to support your views.

## Publication of submissions

Unless submissions clearly request otherwise, all submissions will be published online. Submissions that contain defamatory or offensive content will not be published. The *Freedom of Information Act 1982 (Cwlth)* applies to the NTC.



## Foreword

The National Transport Commission (NTC) is an independent organisation established under the National Transport Commission Act 2003 (Commonwealth) and an Inter-Governmental Agreement for Regulatory and Operational Reform in Road, Rail and Intermodal Transport. NTC is responsible for developing nationally consistent reforms in road, rail and intermodal transport and for evaluating, monitoring, reviewing and maintaining those reforms.

In May 2009, the Australian Transport Council (ATC) recommended the establishment of a Single National Rail Safety Regulator, that decision being endorsed by the Council of Australian Governments in December 2009. NTC was tasked with developing Rail Safety National Law (the National Law), based on the NTC Model Rail Safety Bill (2007) and Model Regulations (the Model Law).

Following previous initiatives to develop more nationally consistent arrangements, the reform represents a historic moment and unique opportunity to achieve a truly national system of rail safety regulation. It comes at a time when rail transport has been increasingly identified as a key means of servicing the growing nation-wide demand for safer, more productive and environmentally friendly transport services and infrastructure.

On 4 November 2011, the Standing Council on Transport and Infrastructure (SCOTI, formerly ATC) endorsed the National Law and accompanying regulatory impact statement, which assessed the cost impacts and benefits of the transition from Model Law to the National Law.

Included in the National Law are requirements relating to fatigue risk management. The outstanding issue of whether the National Law should further regulate and place limits around hours of work and rest for rail safety workers is being considered in this draft regulatory impact statement. It is expected that the proposal contained in this paper will operate in conjunction with the already-established requirements in the National Law and form an integrated policy for the consistent regulation of fatigue risks in the rail sector.

Consideration of this issue is in recognition of the fundamental changes to the Australian rail industry's structure, ownership and competitive position in the provision of land transport services, with rail transport operators extending services beyond historical boundaries and integrating with road and shipping operations. Many of these changes have impacted on traditional work practices, including shift lengths and rostering of workers, focusing attention on fatigue as a workplace safety issue. National agreement on this matter is an important step forward for the rail industry, resolving a longstanding policy issue where local variations have led to inconsistent requirements between the states and territories.

I acknowledge the efforts of NTC staff that have contributed to this draft regulatory impact statement, including Dr Jeff Potter and Monica Kishore. I further acknowledge the contributions of the National Rail Safety Regulator Project Office, Expert Panel, Fatigue Academic Working Group, Commonwealth, state and territory government policy makers, rail safety regulators as well as industry and union representatives.

Public comment is now invited on this draft regulatory impact statement and the proposed option for the further regulation of hours of work and rest for rail safety workers. Feedback will be considered in determining whether to further amend the draft proposal and National Law, recognising that further policy development may be required. Following this process, the final regulatory impact statement will be submitted to the SCOTI for consideration in May 2012.



Greg Martin PSM  
Chairman





## Executive summary

In May 2009, the Australian Transport Council (ATC) recommended the establishment of a Single National Rail Safety Regulator (the Regulator), that decision being endorsed by the Council of Australian Governments (COAG) in December 2009. The National Transport Commission (NTC) was tasked with developing Rail Safety National Law (the National Law), based on the NTC Model Rail Safety Bill (2007) and Model Regulations (the Model Law).

Following previous initiatives to develop more nationally consistent arrangements, the reform represents a historic moment and unique opportunity to achieve a truly national system of rail safety regulation. It comes at a time when rail transport has been increasingly identified as a key means of servicing the growing nation-wide demand for safer, more productive and environmentally friendly transport services and infrastructure.

The overall objectives of the reform, as directed by COAG, are to develop a body of uniform rail safety national law that:

- supports a seamless national rail transport system
- does not reduce existing levels of rail safety
- streamlines regulatory arrangements and reduces the compliance burden for business
- improves national productivity and reduces transport costs generally.

COAG further directed that the National Law be developed to achieve the best outcomes in rail safety utilising a co-regulatory approach, assigning risk management responsibilities to duty holders and oversight power to the Regulator. Additionally, COAG instructed that the issues surrounding fatigue risk management were to be resolved and included in the National Law. The fatigue risk management requirements represent an area where national agreement could not previously be reached.

Contending with varying state and territory rail safety laws increases the regulatory burden and operating costs to the rail industry, adversely impacting on the competitive position and efficiency of interstate rail operations in particular. This inefficiency also diverts resources from achieving best practice safety outcomes.

Substantial progress was made in developing fatigue risk management provisions in National Law during 2010, with elements of the mandatory fatigue risk management program developed through extensive consultation and agreed by stakeholders. The provisions were endorsed by the Standing Council on Transport and Infrastructure (SCOTI) on 4 November 2011.<sup>1</sup>

The issue, however, of whether the National Law should further regulate, or place limits around, hours of work and rest for rail safety workers as a 'safety net' remained outstanding. The matter was subsequently referred to an expert panel for advice.

This draft regulatory impact statement explores the impacts, costs and benefits of the options for further regulating the hours of work and rest of rail safety workers. It examines existing state-based approaches and also regulatory options that operationalise advice provided by the Expert Panel and academic experts (the Fatigue Academic Working Group).

The proposal contained in this paper will operate in conjunction with the already-established requirements in the National Law and form an integrated policy for the consistent regulation of fatigue risks in the rail sector.

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<sup>1</sup> Rail Safety National Law and accompanying regulatory impact statement (November 2011), available at <http://ntc.gov.au/viewpage.aspx?ArealD=34&DocumentId=1925>.

## Current regulation of hours of work and rest

Rail transport operators are required to establish their own specific rules around hours of work and rest for all rail safety workers commensurate to the risk profile of the particular organisation.

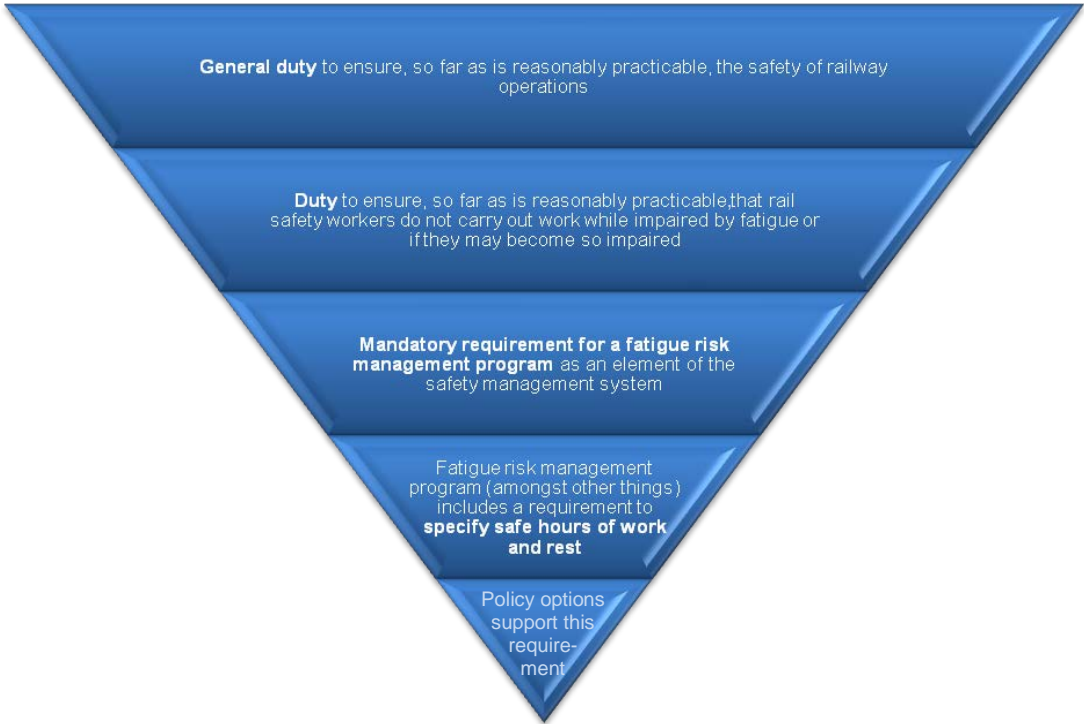
The New South Wales fatigue risk management provisions incorporate further limitations on maximum hours of work and minimum periods of rest as a 'safety net' for rail safety workers who drive trains. While other states and territories have not adopted this approach, Queensland has recently made regulations with provisions similar to those in New South Wales (transitional provisions within these regulations provide that the provisions do not apply to a train operator's railway operation until 11 February 2013).

In other states and territories, where there are no legislated hours of work, the approach to working time restrictions is solely through the co-regulatory risk management process; rail transport operators document policies and principles behind their rostering practices in their fatigue risk management programs under the oversight of regulators.

To support operators in developing their safety management systems, particularly in the absence of specific requirements, various tools, including standards and guidelines, are available to assist operators in achieving compliance.

Figure 1 provides a visual representation of the already-established fatigue risk management provisions and how the policy options examined in this regulatory impact statement would integrate with these requirements to provide for the consistent regulation of fatigue risks in the rail sector.

**Figure 1. Hierarchy of fatigue risk management duties on rail transport operators**



## Scope of the regulatory impact statement

This draft regulatory impact statement does not reassess the establishment of a national regulator or the fatigue risk management requirements in the National Law. Instead this supplementary draft regulatory impact statement is solely concerned with a national approach to the matter of further regulating hours of work and rest for rail safety workers.

In keeping with the methodology of the previous regulatory impact statement, the options contained in this draft regulatory impact statement have been assessed relative to a 'base case' or 'counterfactual'.

The base case is as follows:

- The National Rail Safety Regulator is established and there is a national accreditation scheme in place.
- The National Law has been implemented.
- Existing state-based variations continue to exist in the way in which hours of work and rest for rail safety workers are further regulated.
  - This means that New South Wales has retained its restrictions of rail safety workers who drive trains, as set out in Schedule 2 to the *Rail Safety Act 2008* (NSW).

It is assumed that this will be implemented by introducing New South Wales rail safety law, which will apply in addition to the National Law.

Therefore, to operate in New South Wales, an operator will either have to:

- comply with Schedule 2 to the *Rail Safety Act 2008* (NSW) for any operations in that state, or
- seek an exemption from the provision.
- Other states and territories do not prescribe any limitations on hours of work or rest.<sup>2</sup>

The above assumptions allow consideration of limitations on hours of work and rest, without double-counting previously assessed costs and benefits of the Regulator and National Law. It also allows for the consideration of changes to existing state-based regulatory approaches.

This draft regulatory impact statement is concerned solely with the impacts of the regulatory options. How the Regulator would administer the regulation, and how it would regulate compliance with the law, is subjective and cannot be addressed through this process.

Additionally, it is acknowledged that limiting hours of work and rest for rail safety workers overlaps with similar matters addressed via industrial processes. Industrial agreements are negotiated over time and address safety as well as other considerations such as the family, social, work/life balance and staff productivity. The Commonwealth *Fair Work Act 2009* contains provisions that override state laws to the extent that they are inconsistent. As such, industrial agreements covered by the Commonwealth Fair Work Act have primacy over the National Law on this matter.

Finally, it is important to note that the National Law is concerned with managing fatigue-related risks to safety, as opposed to rail safety worker fatigue. This is an important distinction. While one method of controlling fatigue-related risks to safety is to manage fatigue directly, it is possible for fatigue-related risks to be effectively managed via other controls, such as engineering controls designed to mitigate the effects of an impaired worker (examples include vigilance devices or Automatic Train Protection). As such, the analysis contained in this regulatory impact statement addresses the costs, benefits and impacts of the various options on the management of fatigue-related risks to the safety of rail operations. The potential downstream effects of rail safety worker fatigue, such as the impact on health and the healthcare system, are not relevant to the analysis.

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<sup>2</sup> Queensland made regulations on 2 February 2012, similar to those in New South Wales, which prescribe maximum hours of work and minimum periods of rest for rail safety workers who drive trains. Transitional provisions within these regulations provide that the provisions do not apply to a train operator's railway operation until 11 February 2013, which is after the proposed date for the commencement of the National Law (due by 1 January 2013). Regulatory compliance obligations at the time of implementation of the National Law in Queensland will not have been required to change; as a result, the analysis in this draft regulatory impact statement is based on current practice. A unanimous decision by Ministers on a nationally consistent approach (under an option presented in this draft regulatory impact statement) will supplant existing state and territory approaches, as the enactment of the National Law will replace existing state and territory legislation.

## Options assessed

The options assessed in this draft regulatory impact statement centre on the provision of a 'safety net' with respect to the hours of work and rest of rail safety workers; in particular, whether a risk-based approach should operate within prescribed outer boundaries or not.

The base case is to retain the existing state-based variations with respect to hours of work and rest.

Options 1 and 2 allow for nationally consistent arrangements that are based on the different state-based approaches currently in place.

**Option 1: No prescribed hours of work/rest are included in the National Law** – a performance-based approach is applied, where the requirements of the National Law (as currently drafted) are applied consistently across Australia. The option allows operators to establish hours of work and rest through the risk-based approach, subject to consultative provisions and regulatory oversight.

This option represents a change to the law as it applies in New South Wales, and results in the removal of existing legislated hours of work and rest for rail safety workers who drive trains.

This option has no impact on the regulatory arrangement in other states and territories relative to the baseline.

**Option 2: New South Wales arrangements are included in the National Law (applied nationally)** – national consistency is achieved by adopting the New South Wales arrangements relating to train driving hours, supplementing the risk-based approach already included in the National Law. This option would not impose any change on the regulatory arrangements in place in New South Wales relative to the baseline. However, prescribing maximum hours of work for train drivers would represent a change in all other states and territories.

Options 3 and 4 represent regulatory options that operationalise advice provided by the Expert Panel and subsequent recommendations of the Fatigue Academic Working Group.

**Option 3: Simplified risk based approach to limiting hours of work and rest** – proposes a framework to guide operators on additional controls needed to mitigate risks as hours of work increase and periods of rest decrease. The point at which additional controls are needed is specified, although the form of the control required is not mandated. The framework also specifies 'outer limits' or minimum periods of intra-shift, inter-shift and inter-sequence breaks as a 'safety net'.

**Option 4: Risk based approach to limiting hours of work and rest with consequence based categorisation of rail safety workers** – like option 3, this framework specifies 'outer limits' or minimum periods of inter-shift and inter-sequence breaks as a 'safety net'. It also requires operators to categorise different classes of rail safety workers based on the potential impact of working while fatigued. In addition it provides guidance on additional controls needed to mitigate the risks associated with the combination of inter-shift and inter-sequence breaks with the consequence assessment, resulting in an additional set of 'aggregate outer limits' for each worker category.

Under all options, the requirements of the existing provisions in the National Law, including Regulation 29 of the National Rail Safety Regulations (the National Regulations), will continue to apply. That is to say, operators will still be required to meet the overarching duties for safety and fatigue risk management, maintain fatigue risk management programs and operate the systems required to sustain them, and the Regulator would need to assess them. As such, all the above options supplement these overarching requirements as opposed to supplanting them.

## Assessing safety and economic impacts

Fatigue is an important issue to be managed in rail, but it is not possible to accurately quantify the size of the problem and benefits of reform because:

- The causal link between fatigue and rail incidents is complex and involves multiple factors
- No evidence is available to establish a connection between regulatory changes and fatigue-related risk.

Given the strong safety record in existing Australian rail operational practices, NTC is unable to make a significant case for change. This conclusion points to an outcome that supports Option 1, which is not introduce any additional mandatory, or quasi-mandatory, limitations around hours of work or rest.

Frontier Economics was commissioned to undertake an economic assessment based on a social cost–benefit analysis. The findings are summarised in *Table 1*. As there is little evidence to support differing fatigue-related safety outcomes for each option, the analysis hinges on the relative costs of each option and the extent to which they affect the management of the overall risks of the operation.

The analysis concludes that prescriptive approaches impose more administrative compliance costs than non-prescriptive options. In terms of regulatory efficiency, Option 1 is favoured over Options 2, 3 and 4, which represent varying levels of prescription. This finding supports the qualitative analysis of impacts.

**Table 1. Economic analysis – ranking of options relative to the base case**

Cost type	Option 1	Base case	Option 4	Option 2	Option 3
Operators' costs of achieving compliant rosters	0	0	-	--	---
Operators' administrative costs	+	0	--	-	--
Regulator's administrative costs	By and large limited to one-off transition costs, and unlikely to be materially different across options.				
Industry competitiveness/competition benefits	+	0	-	--	--
<b>Overall ranking</b>	<b>+</b>	<b>0</b>	<b>-</b>	<b>--</b>	<b>---</b>

*Table 1 notes: A positive ranking (+) is assigned to options with a favourable impact relative to the baseline (0) and a negative ranking (-) is assigned to options with an unfavourable impact.*

### **Performance-based versus prescriptive regulation**

From a policy perspective, while providing certainty, prescriptive approaches can negatively impact safety, efficiency and productivity; this may particularly impact the areas of mining and freight operations. The diversity of rail operations, and the wide range of rail safety work undertaken, makes it difficult to establish a single set of restrictions applicable in all circumstances.

Prescriptive rules are likely to limit the flexibility of the law for low-risk operations and impose increased compliance costs. Additionally, scarce resources may be diverted to administrative compliance activities, rather than improved safety outcomes.

A key concern identified in this report is that prescriptive limits can place excessive focus on managing fatigue risks at the expense of other risks in the safety management system. In this way,

the overall risk of operations may inadvertently increase and regulatory effort may be unevenly distributed.

Prescriptive limits may also shift focus away from risk management as the limits become 'safe' rostering targets and acceptable practice sanctioned by government, without due regard to the risk environment.

Non-prescriptive regulation better meets the objectives of the rail safety reform, supporting the co-regulatory nature of the law, streamlining regulatory arrangements and reducing the compliance burden and costs to industry. Additionally, it does not prevent operators from considering all factors affecting the safety of operations and taking a more holistic approach to reducing safety risks.

### ***Embracing better practice***

Importantly, the proposal embraces the principle of continuous improvement and better practice in fatigue risk management by leveraging the substantial research and significant work undertaken by the Expert Panel and Fatigue Academic Working Group. While the analysis does not support mandated compliance with a 'safety net', this work reflects the current best level of knowledge for effective management of fatigue in the workplace.

NTC strongly recommends that the fatigue experts' work is incorporated into guidance material, thus making it widely available and strengthening the capacity of both the Regulator and industry.

In this way, regulated parties can apply current leading practice, whilst still having the flexibility to tailor their fatigue risk management program to their specific circumstances and integrate the program with the management of other risks in the safety management system. The Regulator also has the flexibility to adjust requirements and improve practices in light of new information and innovation.

The performance-based requirement is therefore more adaptable and responsive to the diversity of the Australian rail industry, operating environments and the differing tasks of rail safety workers.

### ***Better safety outcomes***

Concerns may be raised that the absence of any prescribed hours relating to rail safety workers who drive trains signifies a diminution of safety; this is nevertheless not considered to be an accurate interpretation as the analysis reveals that a well-informed and skilled Regulator serves as an effective 'safety net', without the need for legislated limits.

The already-established fatigue risk management provisions under the National Law provide the Regulator with the ability to enforce standards as it considers appropriate; as such, the law allows for an effective 'safety net', without the need for legislated limits.

The authority of the Regulator to enforce standards as it deems appropriate to an operator's risk profile, may lead to better safety outcomes and greater efficiency for industry than a prescribed, 'one-size-fits-all' approach. Notably, under Option 1, there are no legislative impediments to compliance tools evolving based on the latest research and emerging science.

The recommendation to incorporate the evidence-base provided by the academic experts into guidance material supports the strengthening of the knowledge and capacity of both the Regulator and industry. It is recognised that, to be effective and to ensure that safety is not diminished, the Regulator itself must be well-informed and competent. To support this, the National Rail Safety Regulator Project Office has committed to up skilling of regulatory officers and promotion of nationally consistent competency in the area of human factors risk management.

In summary, with a well-informed and skilled Regulator and the provision of high-quality guidance material based on the substantial work undertaken by the academic experts, Option 1 supports the application of better practice and learning to fatigue risk management in a diverse and growing rail sector.



## **Consultation**

The development of the policy options presented in this draft regulatory impact statement has been shaped by significant preliminary analysis and consultation with a variety of stakeholders.

In developing the National Law, NTC and the National Rail Safety Regulator Project Office released a number of policy papers and convened stakeholder workshops over 2010 and 2011. Stakeholders consulted during this process included Commonwealth, state and territory government policy makers, rail safety regulators, rail industry members, rail industry associations and unions.

Various submissions have been received on the matter of prescribed hours of work and rest; these submissions have informed the discussion in this draft regulatory impact statement and served to provide the basis for development of the policy options presented in this document.

Furthermore, in preparing this draft regulatory impact statement and gathering data, NTC has engaged with a number of stakeholders. Input has been received from industry members and union representatives, as well as state and territory rail safety policy departments and regulators, who have provided ongoing advice and feedback.

Additionally, the Rail Safety Advisory Committee (comprising policy makers from the Commonwealth, state and territory governments as well as regulators, industry and union representatives) and Rail Safety Regulation Reform Project Board (a sub-group of the Transport and Infrastructure Senior Official's Committee) have been consulted prior to release of this document for public comment.

From feedback received to date, it has become evident that all stakeholders support the established risk-based approach of the National Law but that the issue of whether the law should specify further controls on hours of work and rest has been an area of divergence, with stakeholders divided in their views on whether further prescription is required.

## **Public comment**

Public comment is invited on the draft regulatory impact statement and the proposed option for the regulation of hours of work and rest for rail safety workers. Feedback will be considered in determining whether to further amend the draft proposal and National Law, recognising that further policy development may be required. Following this process, the final regulatory impact statement will be submitted to SCOTI for consideration in May 2012.





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# 1. Introduction

The Australian rail industry is undergoing fundamental changes to its structure, ownership and competitive position in the provision of land transport services. Operators are extending services beyond historical boundaries and integrating them with road and shipping operations. Many of these changes have impacted on traditional work practices including shift lengths and rostering of workers, focusing attention on fatigue as a workplace safety issue. Fatigue has been linked to degraded operational performance and has been identified as a contributing factor in accidents and incidents in railway systems and in other industries. As a result, a significant amount of research has been undertaken on the effects and management of fatigue in the transport sector.

The rail industry is diverse and, therefore, fatigue-related issues vary from operator to operator. The nature, levels and types of risk can vary between services – urban passenger, intercity passenger or freight, interstate freight, and tourist and heritage. The impact of fatigue on operations can also vary between the different categories of rail worker.

The national Model Rail Safety Bill (2007) (the Model Bill) requires rail transport operators to manage the safety risks related to the fatigue of 'rail safety workers' (a broad class that includes drivers, signallers, and various other workers involved in rail safety work) as part of a safety management system. The Model Bill was designed to be used as the basis for the harmonisation of rail safety laws in each of the states and territories, subject to some local variations. There are a number of variations in the way fatigue risk management has been implemented in states and territories and differences between regulatory models remain.

At the Council of Australian Governments' (COAG) meeting on 7 December 2009, Australian governments agreed to a Single National Rail Safety Regulator (the Regulator) to be hosted in South Australia. As part of implementing this decision, the Model Bill was used as the basis for developing National Law, to be referenced in the same form in each state and territory.

The overall objectives of the reform, as directed by COAG, are to develop a body of uniform rail safety national law that:

- supports a seamless national rail transport system
- does not reduce existing levels of rail safety
- streamlines regulatory arrangements and reduces the compliance burden for business
- improves national productivity and reduces transport costs generally.

COAG further directed that the National Law be developed to achieve the best outcomes in rail safety, utilising a co-regulatory approach, assigning risk management responsibilities to duty holders and oversight power to the Regulator.

A regulatory impact statement, endorsed by the Standing Council on Transport and Infrastructure (SCOTI) on 4 November 2011, has assessed the impacts, costs and benefits of proposed amendments to the Model Law; these amendments resolved policy matters and included modifications necessary to form a body of National Law to be administered by the Regulator.<sup>3</sup> Through the requirement for mandatory fatigue risk management programs and the prescribed requirements for these programs, the National Law necessitates that rail transport operators manage fatigue-related risks to safety and hours of work and rest for rail safety workers.

The outstanding issue of whether the National Law should further regulate, or place limits around, hours of work and rest for rail safety workers as a 'safety net' is being considered in this draft regulatory impact statement, which effectively serves as an addendum to the regulatory impact statement endorsed on 4 November 2011.

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<sup>3</sup> Rail Safety National Law and accompanying regulatory impact statement (November 2011), available at <http://ntc.gov.au/viewpage.aspx?Areald=34&DocumentId=1925>.

This draft regulatory impact statement explores the impacts, costs and benefits of the various options for further regulating the hours of work and rest of rail safety workers. It examines existing state-based approaches towards the matter and includes regulatory options that operationalise advice provided by academic experts commissioned specifically to assist this policy process. The proposal contained in this paper will operate in conjunction with the already-established requirements in the National Law and form an integrated policy for the consistent regulation of fatigue risks in the rail sector.

National agreement on this matter is an important step forward for the rail industry, resolving a longstanding policy issue where local variations have led to inconsistent requirements between the states and territories.

## 2. Background

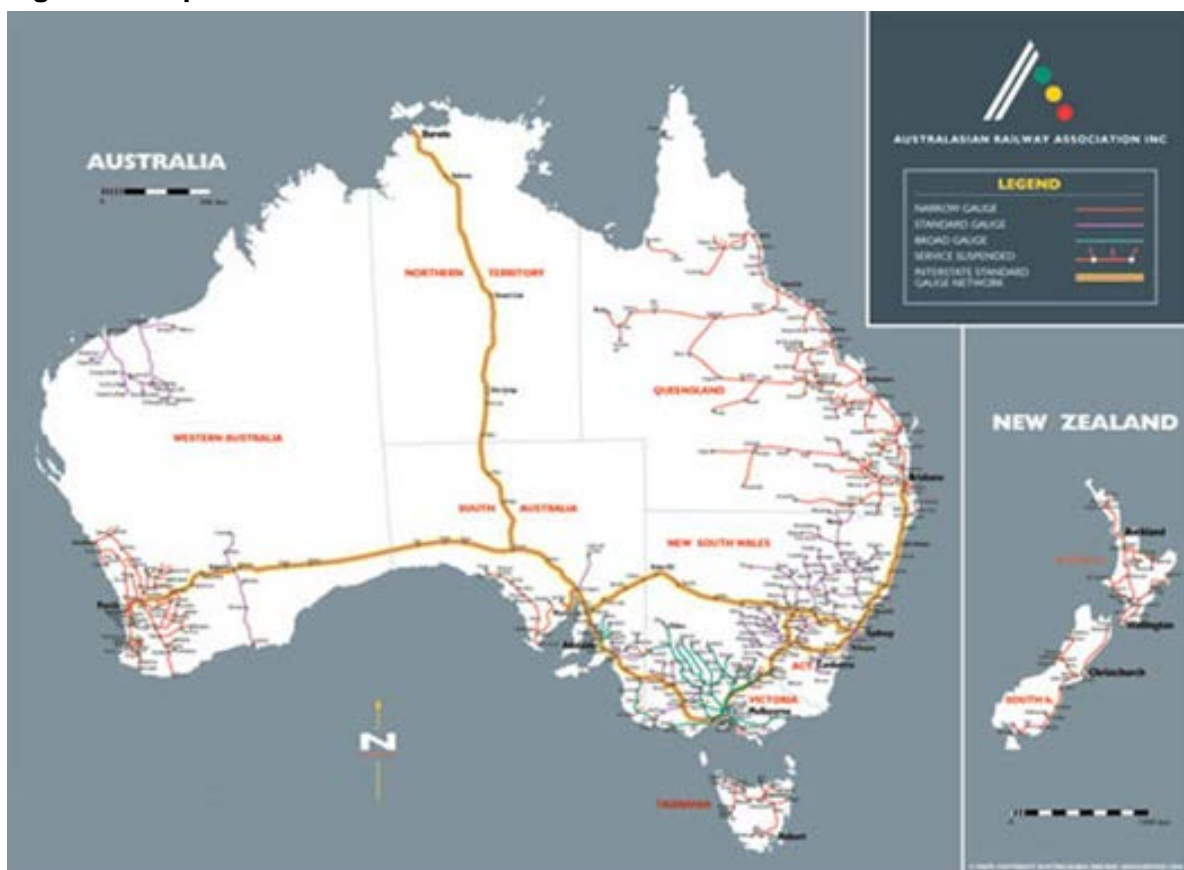
### 2.1 Rail industry overview

In 2008, the rail industry contributed \$6.47 billion to the Australia's gross domestic product, employing approximately 10 per cent of the transport and storage workforce.<sup>4</sup> The national rail network services a population of almost 22.5 million people and runs on approximately 39,000 kilometres of track.

At present, approximately one third of the rail industry operates in more than one state or territory. The need to comply with varying state and territory rail safety laws increases the regulatory burden and operating costs to the rail industry, as well as the cost to policy makers and rail safety regulators. This adversely impacts on the competitive position and efficiency of interstate rail operations in particular. This inefficiency also diverts resources from achieving best practice safety outcomes.

Australia's rail industry is a mix of urban, regional and interstate or national operations, as shown in *Figure 2*. Railways tend to be situated in, or operate within, defined areas (metropolitan cities or regional areas such as the Hunter Valley, the Queensland coal fields or the Western Australian Pilbara mining region) or between capital cities and strategically important intermodal terminals. Australia's rail operations are largely confined to areas stretching from the east to the west coast along the south coast, vertically through the country's centre and along the east coast.

**Figure 2. Map of Australia's rail network<sup>5</sup>**



<sup>4</sup> Bureau of Infrastructure, Transport and Regional Economics, 2009, *Australian transport statistics yearbook 2009*. BITRE, Canberra, ACT (page 11).

<sup>5</sup> Australasian Railways Association.

Nationally, the proportion of freight and passenger train movements has remained relatively constant at approximately 40 and 60 per cent respectively of total train kilometres.<sup>6</sup>

## 2.2 The current rail safety regulatory framework

Rail safety regulation is relatively new to Australia, having been in place for less than 20 years. Prior to this, railways were government-owned and vertically integrated, rendering them directly accountable to governments.<sup>7</sup>

In 1996 the Commonwealth, states and territories signed an Inter-Governmental Agreement on Rail Safety. The agreement was to establish a cost effective, nationally consistent approach to rail safety, developed to lower barriers for entry of third party operators. In accordance with the Inter-Governmental Agreement, all parties undertook to legislate for rail safety, and more specifically, to include provisions in state and territory legislation sufficient to meet the terms and conditions of the agreement.

Rail transport operators are best-placed to understand their own specific operational environment and risks. In response to this, and the diversity of operations and operating environments in the Australian rail context, Australia's rail safety legislation is co-regulatory, involving a process by which rail transport operators assess the risks associated with their railway operations and then establish a safety management system to manage them. In this way, the responsibility for risk management lies with the rail transport operator and regulatory bodies are provided with oversight powers.

Co-regulation is a regime that favours adaptability and responsiveness. It provides flexibility that supports operators in aligning their risk management with the scope and nature of their operations and risk profile, promoting efficiency, and encouraging localised innovation. It is neither prescriptive, nor self-regulatory. Unlike other forms of regulation where rules and standards are prescribed by governments, rail safety legislation predominantly legislates the management obligations on duty holders and relies on regulatory oversight to monitor the effectiveness of the duty holder's risk management process.

In theory it is possible to structure rail safety law on the basis of a single overarching requirement for operators to manage (so far as is reasonably practicable) all risks to safety. However in practice, rail safety legislation across Australia has long included elements of prescription, defined as "focus[ing] on input standards and specify[ing] precisely what actions must be taken to achieve compliance".<sup>8</sup> In practice, there are degrees of prescription. Rail safety law does not tend to specify requirements with a high degree of precision; rather, it prescribes parameters around the process by which an operator must develop a safety management system, ensuring that the co-regulatory process is predominantly maintained. In this way, a level of prescription may serve to formalise the manner by which the risk management approach of a rail transport operator needs to be presented in the safety management system and, in some cases, may reduce the degree of flexibility for operators in determining how safety shall be managed.

Australia currently has seven rail safety regulators across the eight states and territories, all administering their own rail safety laws. The regulators oversee the co-regulatory rail safety regime to enable and promote safe railway operations. A key objective is for regulators to work with rail

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<sup>6</sup> Australian Transport Safety Bureau, *ATSB Transport Safety Report, Australian Rail Safety Occurrence Data 1 January 2001 to 31 December 2009*. Commonwealth of Australia, Canberra (p.15).

<sup>7</sup> The management of rail infrastructure, rolling stock operating on it and the provision of support services was undertaken by the same entity (government). This is unlike how much of the rail industry in Australia is structured today.

<sup>8</sup> National Transport Commission/Jaguar Consulting (2004). *Identification and Examination of Best Practice Principles for Rail Regulation: Working Paper*. National Transport Commission, Melbourne (p.3), available at <http://www.ntc.gov.au/filemedia/Reports/IdentExamBestPractRailJan2004.pdf>.



transport operators, rail safety workers, and others involved in railway operations, to improve rail safety. The regulators are charged with conducting research and publishing information relating to rail safety and providing, or facilitating the provision of, advice, education and training. It is essential to develop a common understanding of the risks to safety between the regulator and regulated, to ensure that risks are mitigated effectively.

Rail transport operators must comply with both rail safety and work health and safety laws. A number of duties under these bodies of law overlap, most notably the overarching duty to ensure the safety of rail operations (or workplaces more broadly under work health and safety law). The National Law imposes a number of additional requirements developed to address the management of safety risks that apply specifically to railway operations.

Similar to rail safety laws under existing arrangements, work health and safety laws are implemented at the state and territory level. They also are subject to national model law. The Workplace Relations Ministers Council endorsed the Model Work Health and Safety Act on 11 December 2009. Each state and territory and the Commonwealth were required to enact laws that reflect the Model Work Health and Safety Act by the end of 2011, with commencement on 1 January 2012.

## **2.3 The Model Rail Safety Bill (2007) and Regulations (the Model Law)**

The Model Law was developed by NTC with the objective of further supporting nationally consistent and best-practice rail safety law.<sup>9</sup> Supported by a regulatory impact statement, it was approved by the Australian Transport Council (ATC) in 2006, making it available to states and territories for implementation.<sup>10</sup>

All states and territories, with the exception of the Australian Capital Territory, which does not regulate rail safety, have implemented rail safety law that is based on the Model Law, although some transitional arrangements mean that not all provisions have commenced as yet.

Approval and progressive implementation of the Model Law represented an important step towards a nationally consistent system of rail regulation. However, this arrangement preserved some key limitations; these include variations in how states and territories have implemented the Model Law, as well as the need for rail transport operators to be separately accredited in each state or territory in which they operate.

## **2.4 The Single National Rail Safety Regulator**

In 2008, ATC endorsed the National Transport Policy Framework developed by NTC, and agreed to a program of national reform to address significant national challenges across all transport modes. The National Transport Policy Framework outlined a 'new thinking' approach to transport policy, which reflected changing industry and operating environments, with the objective of developing a seamless, coordinated transport system. From this, ATC considered the options of establishing national frameworks for the regulation of heavy vehicles, marine safety and rail safety to establish a genuine national market and a seamless regulatory framework.

Following the release of a regulatory impact statement in July 2009, COAG agreed in December 2009 to proceed with establishing a Single National Rail Safety Regulator (the Regulator) and National Law.<sup>11</sup> The total incremental benefit (that is, against the current regulatory

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<sup>9</sup> Available at <http://ntc.gov.au/viewpage.aspx?documentid=1667>.

<sup>10</sup> *Rail Safety Reform Bill – Draft Regulatory Impact Statement for Consultation* (October 2005) and *Model Rail Safety (Reform) Regulations: Draft Regulatory Impact Statement* (July 2006), published by the National Transport Commission, available at <http://ntc.gov.au/viewpage.aspx?documentid=1667>.

<sup>11</sup> *Single, National Rail Safety Regulatory and Investigation Framework Regulatory impact Statement* (July 2009), available at <http://www.ntc.gov.au/viewpage.aspx?documentid=1927>.

environment) of establishing a single national model of rail safety regulation and law was assessed at between \$36 and \$67 million.

The Regulator will be established as an independent statutory agency under legislation of the South Australian Parliament as a commission structure managed by the Regulator or chief executive officer supported by two assistant commissioners.

## 2.5 The National Law

Following the decision to establish a Single National Rail Safety Regulator, COAG and ATC directed NTC to develop a body of rail safety national law (the National Law) to be administered by the Regulator. COAG further directed that the National Law be developed using the NTC Model Rail Safety Bill (2007) and Model Regulations (the Model Law) as the basis.<sup>12</sup>

The overall objectives of the reform, as directed by COAG, are to develop a body of uniform rail safety national law that:

- supports a seamless national rail transport system
- does not reduce existing levels of rail safety
- streamlines regulatory arrangements and reduces the compliance burden for business
- improves national productivity and reduces transport costs generally.

The National Law was developed to achieve the best outcomes in rail safety, utilising the co-regulatory approach to risk management, assigning risk management responsibilities to duty holders and oversight power to the Regulator.

The National Law resolved a number of policy matters where states and territories had varied from the Model Law or where the Model Law allowed for variations, as well as any amendments necessary to form a body of law that could be administered on a national level (such as a national scheme for accreditation). A regulatory impact statement, endorsed by SCOTI on 4 November 2011, assessed the impacts, costs and benefits of amendments to the Model Law.<sup>13</sup> The amendments were estimated to support benefits of between \$28 and \$71 million, measured in terms of reduced costs to society resulting from improved levels of rail safety.

The Regulator, administering the National Law, will be operational in 2013.

### 2.5.1 Fatigue risk management policy development

As part of the decision of December 2009 to proceed with the establishment of the Regulator, COAG further directed that the issues surrounding fatigue risk management were to be resolved and included in the National Law. The fatigue risk management requirements represent an area where national agreement could not previously be reached through development of the Model Law. As such, the Model Law is silent on the requirements for a fatigue risk management program and allowed for the states and territories to vary in their approaches.

Substantial progress was made in developing the National Law fatigue risk management provisions during 2010, with elements of the mandatory fatigue risk management program developed through extensive consultation and agreed by stakeholders (refer to *Section 3. Existing provisions for*

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<sup>12</sup> Available at <http://ntc.gov.au/viewpage.aspx?documentid=1667>.

<sup>13</sup> Rail Safety National Law and accompanying regulatory impact statement (November 2011), available at <http://ntc.gov.au/viewpage.aspx?Areald=34&DocumentId=1925>.



*fatigue risk management in the National Law*). These agreed provisions are reflected in the National Law and were assessed in its accompanying regulatory impact statement.<sup>14</sup>

Taking a risk-based approach, rail transport operators must prepare and implement a fatigue risk management program. The National Law proposes consistent minimum requirements designed to prompt operators to take into account the variety of risks in this complex area. In addition to these factors, operators are required to specify work scheduling practices that are designed to manage the fatigue risks so far as is reasonably practicable.

States and territories varied in their regulatory approaches as to how operators are required to approach the scheduling of work and rest, with New South Wales opting to prescribe maximum hours of work and minimum periods of rest for rail safety workers who drive trains, and other states and territories leaving operators to determine such restrictions based on a purely risk-based approach.

As of late 2010, the issue of whether the National Law should prescribe maximum hours of work or minimum periods of rest for rail safety workers as a 'safety net' remained outstanding. As such, the prescription of hours was not addressed in the National Law or its accompanying regulatory impact statement; rather the matter was referred to an Expert Panel for further policy development and the options and impacts assessed in this draft regulatory impact statement.

### ***The Expert Panel and Fatigue Academic Working Group***

In late 2010, an Expert Panel, comprising policy, academic and industry representatives, was established by ATC to consider whether the National Law should specify maximum hours of work and/or minimum periods of rest and to which rail safety workers such limits should apply to (amongst other matters).

The Expert Panel noted that the risk management process taking into account those factors already agreed (refer to *Section 3. Existing provisions for fatigue risk management in the National Law*) should result in a set of rostering hours that manages fatigue-related risks so far as is reasonably practicable. However, the Expert Panel also recognised that this approach could be open to exploitation, and recommended a hybrid approach, allowing the risk management process to operate within boundaries.

A single set of hours or boundaries for all rail safety workers was not supported by the Expert Panel on the basis that a 'one-size-fits-all' approach would not be suitable across the entire rail sector.<sup>15</sup> Instead, the Expert Panel proposed a tiered approach to the management of fatigue-related risks, with more flexible hours available to those rail operators who can demonstrate the maturity to manage and control fatigue risks to an acceptable level.

The first tier was referred to as 'standard hours'. Working under the standard hours requires an operator to still include all the minimum standards for fatigue risk management programs, and it was envisioned that the majority of operations would function within standard hours.

The Expert Panel also proposed second and third tiers for those operators requiring longer hours or greater flexibility in working time arrangements. It was proposed that operators that want to work under these 'non-standard hours' would be required to provide evidence to the Regulator about how they propose to control any increase in fatigue-related risk attributable to the non-standard working time arrangement. These operators would need to demonstrate that the additional controls they put in place would produce the same or a lower level of risk than is associated with 'standard hours'.

In this way, operators who have the necessary safety infrastructure and maturity to implement safe systems of work would be able to access more flexible approaches for working hours. Most

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<sup>14</sup> Rail Safety National Law and accompanying regulatory impact statement (November 2011), available at <http://ntc.gov.au/viewpage.aspx?Areald=34&DocumentId=1925>.

<sup>15</sup> Represents the views of the majority of members; agreement amongst the panel members was not unanimous.

importantly, the Expert Panel recommended the establishment of a 'safety net', hours of work or rest that operators could not roster beyond.

The Expert Panel's report was endorsed by ATC in May 2011 on the basis that the specific boundaries (the specific hours of work or rest that constitute the 'safety net') indicatively provided for in the report be developed.<sup>16</sup>

In line with the Expert Panel's decision to base the framework on purely safety, rather than industrial or other concerns, NTC established the Fatigue Academic Working Group, a panel of four academic experts in the area of fatigue management – Professor Drew Dawson, Associate Professor Shantha Rajaratnam, Professor Ann Williamson and Associate Professor Sally Ferguson. This group was tasked with the population of the Expert Panel framework and definition of the specific hours of work and rest.

The chosen duty time limitations were developed on the basis of current scientific knowledge in the fatigue domain and expert advice, drawing on necessary additional relevant research as required.

Following this work, there was extensive consultation undertaken with the Rail Safety Regulation Reform Project Board which, based on the Fatigue Academic Working Group advice, was instrumental in the development of regulatory options that expressed that knowledge in workable policy; these are represented in Options 3 and 4. Details of the mechanics of these regulatory options are provided in *Section 8.4. Option 3 – Simplified risk-based approach to limiting hours of work and rest* and *Section 8.5. Option 4 – Risk-based approach to limiting hours of work and rest with consequence-based categorisation of rail safety workers*.

## 2.6 Managing fatigue – work and rest<sup>17</sup>

While a rail transport operator must assess and manage any fatigue-related risks to safety (as opposed to rail safety worker fatigue itself, as described in *Section 5.2.6. Fatigue risk management as distinct from fatigue management*), a basic understanding of fatigue science is considered to be of value in evaluating the regulatory options presented in this draft regulatory impact statement.

### 2.6.1 General

Fatigue is a human condition primarily caused by prolonged wakefulness and/or an insufficient quality or quantity of sleep. It includes physical, cognitive, psychological and physiological dimensions that interact to reduce human performance and lead to uncontrollable sleep onset. The symptoms of fatigue include being sleepy, feeling physically or mentally tired, weary or drowsy, feeling exhausted or lacking energy, and behaving in a way that is consistent with these symptoms.

Fatigue may be caused by a range of factors, both work and non-work related, including:

- physical or mental exertion
- being awake for long periods
- sustained mental or physical effort
- not enough sleep or not enough restorative sleep
- not enough rest breaks.

These factors may be compounded by person's circadian rhythm ('body clock'), environmental stress, age, health and fitness.<sup>18</sup>

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<sup>16</sup> The Expert Panel report is available at <http://www.nrsrproject.sa.gov.au/publications>.

<sup>17</sup> Extract from a discussion paper prepared by the National Transport Commission and Dédale Asia Pacific, released July 2010.

## 2.6.2 Principles of fatigue

The outcome of the relevant research on fatigue can be distilled into a set of basic propositions, outlined in the following sections.<sup>19,20,21,22,23,24</sup>

### **Fatigue**

- Fatigue is psychophysiological: it affects one's physical capacity to perform work and the cognitive and other mental processes used in performing work.
- Work produces fatigue, but the time of day at which work takes place is at least as important as the amount or duration of that work. There is substantial evidence indicating that transport accidents are more likely to occur during night hours. Research on road transport drivers has also indicated that work undertaken during the midnight to dawn period is more fatiguing than work undertaken during the day.
- Fatigue is influenced by the length of time awake as well as the length of time at work, and the nature of the task being undertaken.
- The effectiveness of rest breaks can be influenced by environmental factors (such as temperature, noise and lighting) and by personal and social commitments. Opportunities for rest may be also disrupted significantly when workers are 'on-call' during off-duty times.
- The effects of fatigue may be mitigated temporarily by stimulants such as caffeine or short breaks. Short-term relief from fatigue can also be achieved by short periods of sleep, that is, napping. However, fatigue must inevitably be relieved by sleep. When the need for sleep becomes acute a person may fall asleep with little warning. This can take the form of 'microsleeps' of a few seconds duration, or for longer periods of time.

### **Circadian principles**

- The body is governed by inbuilt biological rhythms attuned to the cycles of day and night. Work is best performed during the day when the bodily system is (other things being equal)

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<sup>18</sup> National Transport Commission (2008). *National rail safety guideline: Management of fatigue in rail safety workers*. National Transport Commission, Melbourne, available at <http://www.ntc.gov.au/viewpage.aspx?documentid=1668>.

<sup>19</sup> National Transport Commission (2004). *Fatigue Management Within the Rail Industry: Review of regulatory approach*. National Transport Commission, Melbourne, available at <http://www.ntc.gov.au/filemedia/Reports/FatigueMngmtRailIndustryOct2004.pdf>.

<sup>20</sup> House of Representatives Standing Committee on Communication, Transport and the Arts (2000). *Beyond the Midnight Oil: An Inquiry into Managing fatigue in transport*. Australian Government. Canberra, available at <http://www.aph.gov.au/house/committee/cita/manfatigue/mfcontents.htm>.

<sup>21</sup> Dawson D, Fletcher A and Hussey F (1999). *Fatigue and transportation: Report to the Neville Committee*. The Centre for Sleep Research, Adelaide.

<sup>22</sup> Dawson D and Reid K (1997). *Fatigue, alcohol and performance impairment*. *Nature*, 388: 235-237.

<sup>23</sup> Dawson D and Reid K (1997). *Equating the performance impairment associated with sustained wakefulness and alcohol intoxication*. *Journal of Centre for Sleep Research*, 2: 1-8.

<sup>24</sup> Williamson AM, Feyer AM, Friswell R and Finlay-Brown S (2000). *Evaluating a regulated hours regime on road and an alternative compliance regime under simulated conditions (CR 190)*. Australian Transport Safety Bureau, Canberra.

awake and alert; the best sleep is obtained at night when there is a strong biological propensity to sleep.

- There are two 'low' points in circadian rhythms: from approximately 3am to 5am and a lesser period in the afternoon from approximately 3pm to 5pm. These low points induce a strong need to sleep and evidence indicates that working through these periods leads to an increased risk of accidents.

### **Sleep**

- There is variation amongst individuals regarding the optimum amount of sleep required, with eight hours considered average for adults.
- Sleep at times of the day other than when there is greatest propensity to sleep is less 'efficient'; it is often shorter because of disturbances and interruptions and is less restorative.
- Sleep 'debt' arising from loss of effective sleep accumulates, and must eventually be 'repaid'. It may be repaid involuntarily if the person does not stop to rest.

### **Fatigue consequences**

- The effects of fatigue include degraded capacity for information processing and decision making; slowed reaction times; reduced alertness, ability to concentrate and motivation, irritability, degraded hand-eye coordination and spontaneous sleeping.
- Fatigue-induced impairment is measurable and, in two Australian studies, has been benchmarked on performance measures against impairment arising from alcohol use.<sup>25</sup> Levels of impairment equivalent to the Australian motor vehicle driver legal blood alcohol limit of 0.05 (0.05g/100ml of blood) were found after 17-19 hours without sleep, and equivalent to the impairment from a blood alcohol limit of 0.1g/100ml of blood after 24-27 hours of sustained wakefulness.
- Fatigue has been identified as a contributing factor in accidents and incidents in railway systems in Australia and other industries, and is therefore an operational safety concern.

### **2.6.3 Key elements of fatigue management**

From these propositions, certain observations can be made regarding effective fatigue management in rail transport.<sup>26,27</sup>

- Fatigue needs to be relieved by adequate restorative rest.
- The time allowed for rest (that is, the time between periods of work) needs to be longer than the amount required for sleep, to allow for personal and social commitments. Rest

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<sup>25</sup> Dawson D and Reid K (1997). *Fatigue, alcohol and performance impairment*. Nature, 388: 235-237; Dawson D and Reid K (1997). *Equating the performance impairment associated with sustained wakefulness and alcohol intoxication*. Journal of Centre for Sleep Research, 2: 1-8.

<sup>26</sup> National Transport Commission (2004). *Fatigue management within the Rail Industry: Review of regulatory approach*. National Transport Commission, Melbourne, available at <http://www.ntc.gov.au/filemedia/Reports/FatigueMngmtRailIndustryOct2004.pdf>.

<sup>27</sup> House of Representatives Standing Committee on Communication, Transport and the Arts (2000). *Beyond the Midnight Oil: An Inquiry into Managing Fatigue in Transport*. Australian Government, Canberra, available at <http://www.aph.gov.au/house/committee/cita/manfatigue/mfcontents.htm>.

time may need to be longer when domiciled at home to allow for domestic needs than if the worker is working away from home.

- The time that rest takes place also needs to be taken into account, as rest during the day will not produce the same benefits for rest and recovery as rest at night.
- Work during circadian low points is more fatiguing, and the time allowed for rest after night work may need to be longer than after work during daylight hours.
- The length of time working is less important than time of day and cumulative fatigue, although they are interrelated and all need to be taken into account. Longer working time may be tolerated (on occasions) if the worker is adequately rested at shift commencement and there is opportunity for restorative rest afterward.
- Fatigue can be managed better if there is some flexibility for the person in the way work and rest is managed.

At the most basic level, fatigue can only be managed effectively if the focus goes beyond time spent working to cover all fatigue-inducing factors.

#### 2.6.4 Operational elements of fatigue management

While consideration of these key elements is critical to successful fatigue management, organisational policies and practices need to complement these elements in order to manage fatigue effectively.

Such policies and practices should ideally include (where appropriate):<sup>28</sup>

- work and rest scheduling practices such as roster design, napping policies, special rest allowances for night work, etc.
- consideration of travel time to and from work
- workplace and environmental initiatives to offset factors that induce fatigue (for example, dampening noise levels in driver cabs, providing ergonomically designed workplaces) and improve the quality of sleep away from home (for example, suitably darkened and sound-proofed sleeping quarters that will increase the opportunity for sound sleep)
- training and education of rail safety workers, roster schedulers, management and families on the consequences of fatigue and methods of minimising and managing fatigue
- consideration of non-work factors that contribute to fatigue, including sleep disorders (for example, insomnia, sleep apnoea), drug usage (alertness enhancing drugs, prescription drugs that cause drowsiness), lifestyles and personality characteristics
- lifestyle and health education for employees
- improved communications between management and employees in respect of fatigue risk management systems, including employee involvement in continuous improvement of fatigue management.

Currently available guidance documents and fatigue management research suggest that at least the following factors should be taken into consideration when forming duty hour limitations:

- *Length of duty periods:* Evidence indicates that human performance deteriorates significantly when shifts exceed 12 hours and that even shifts of eight hours or less can be

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<sup>28</sup> National Transport Commission (2004). *Fatigue management within the Rail Industry: Review of regulatory approach*. National Transport Commission, Melbourne, available at <http://www.ntc.gov.au/filemedia/Reports/FatigueMngmtRailIndustryOct2004.pdf>.

fatiguing “if the work is very intense or demands continuous concentration, or there are inadequate breaks.”<sup>29</sup>

- *Intervals between duties:* The interval allotted to daily rest needs to be sufficient to enable workers to return to work rested after a full sleep. Acute sleep loss occurs after losing as few as two hours of sleep, and results in the onset of fatigue and degraded performance and alertness.<sup>30</sup> If a rest interval is short (for example, eight hours), it is important to ensure that other rest intervals in the shift pattern and breaks during the shift are adequate to compensate.<sup>31</sup> Ideally, the off-duty period should provide the opportunity for eight hours of continuous sleep, and therefore incorporate additional time for transport, meals, showers and the “spin down” time required to fall asleep.<sup>32</sup>
- *Commuting time:* Time spent travelling to and from work should be taken into account, as this time does not provide rest in the same way as time spent at home. The effects of travelling time on the opportunity for daily rest break should be considered.<sup>33</sup>
- *Sleep times and opportunities:* Broken sleep and day sleep are not as restorative as night time sleep.<sup>34</sup> Workers may find it hard to sleep during the day because of circadian effects, and finding appropriate conditions for sleep during the day (for example, darkness, quiet) may also be difficult. A person may lose (on average) two hours sleep for every night shift worked.<sup>35</sup>
- *Recovery or reset breaks:* The frequency and the length of rest days (recovery time) are important for enabling workers to obtain sufficient rest and maintain work performance. Workers may benefit from recovery periods of at least 48 hours at least fortnightly. These rest periods are particularly important for shift workers, particularly those working nights.<sup>36</sup> Frequent recovery periods are more effective in reducing cumulative fatigue than less frequent periods, for example, weekly recovery periods are more likely to relieve acute fatigue than monthly recovery periods.<sup>37</sup>

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<sup>29</sup> Office of Rail Regulation (2006). *Managing Fatigue in Safety Critical Work: Railways and other Guided Transport Systems (Safety) Regulations 2006*. Office of Rail Regulation, London, available at <http://www.rmt-luengineering.co.uk/v1/files/fatigue.pdf>.

<sup>30</sup> Dignes DF, Graeber RC, Rosekind MR, Samel A and Wegmann HM (1996). *Principles and Guidelines for Duty and Rest Scheduling in Commercial Aviation*. NASA Ames Research Center, Moffett Field, available at [http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19990063635\\_1999104236.pdf](http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19990063635_1999104236.pdf).

<sup>31</sup> Office of Rail Regulation (2006). *Managing Fatigue in Safety Critical Work: Railways and other Guided Transport Systems (Safety) Regulations 2006*. Office of Rail Regulation, London, available at <http://www.rmt-luengineering.co.uk/v1/files/fatigue.pdf>.

<sup>32</sup> Ibid.

<sup>33</sup> National Transport Commission (2007). *Guidelines for managing heavy vehicle driver fatigue*. National Transport Commission, Melbourne, available at [http://www.ntc.gov.au/filemedia/bulletins/Guidelines\\_Fatigue\\_August07.pdf](http://www.ntc.gov.au/filemedia/bulletins/Guidelines_Fatigue_August07.pdf).

<sup>34</sup> Ibid.

<sup>35</sup> Ibid.

<sup>36</sup> Ibid.

<sup>37</sup> Office of Rail Regulation (2006). *Managing Fatigue in Safety Critical Work: Railways and other Guided Transport Systems (Safety) Regulations 2006*. Office of Rail Regulation, London, available at <http://www.rmt-luengineering.co.uk/v1/files/fatigue.pdf>.



- *Predictability*: Being 'on call' or having a starting time that varies frequently with little notice makes it difficult for workers to plan adequate sleep and increases the risk of fatigue. Additional control measures such as extra rest breaks and reduced shift length can be considered where shift start times or on-call duties cause significant variations in shift times.<sup>38</sup>
- *Timing of breaks*: The timing of breaks is important. Good practice for driving tasks is to plan a short break every three hours. Breaks are more effective if planned throughout the shift rather than near the beginning or end.<sup>39</sup>
- *Timing of the shift start times*: Night and early morning shifts can lead to reduced sleep and fatigue.<sup>40</sup>
- *Time of day when the work is being performed*: Work performed across circadian low points (for example, midnight to 6am) can result in fatigue.<sup>41</sup>
- *Accumulation of previous hours and days worked without adequate sleep*: It is important to take this factor into account as 'sleep debt' accumulated over a period of time can contribute to fatigue.<sup>42</sup>
- *Weekly work-to-rest ratio*: It is desirable to minimise the number of consecutive night shifts and early shifts worked and allow a break period of two rest days after a block of night or early morning shifts.<sup>43</sup>
- *Shift rotation*: Individuals may prefer to work permanent shift times, to avoid problems with shift exchange and improve work-life balance. Rapid rotation or slow rotation is easier to adjust to than a shift pattern that rotates about once a week. Clockwise rotation from day to evening to night shift is preferable to counter-clockwise change from day to night to evening.<sup>44</sup>
- *High levels of exertion*: Work that is mentally and/or physically demanding can contribute to fatigue. Fatigue can be exacerbated if work is performed across circadian low points.<sup>45</sup>
- *Overtime considerations*: Sufficient time should be allowed after overtime (planned or otherwise) for sleep, travelling and meal breaks before the start of the next shift.<sup>46</sup>

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<sup>38</sup> National Transport Commission (2007). *Guidelines for managing heavy vehicle driver fatigue*. National Transport Commission, Melbourne, available at [http://www.ntc.gov.au/filemedia/bulletins/Guidelines\\_Fatigue\\_August07.pdf](http://www.ntc.gov.au/filemedia/bulletins/Guidelines_Fatigue_August07.pdf).

<sup>39</sup> Ibid

<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

<sup>42</sup> Ibid.

<sup>43</sup> Extract from a discussion paper prepared by the National Transport Commission and Dédale Asia Pacific, released July 2010. Advice provided by Dr Philippe Cabon, a world-recognised fatigue expert, 26 July 2010.

<sup>44</sup> Ibid.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid.

### 3. Existing provisions for fatigue risk management in the National Law

As part of the decision of December 2009 to proceed with the establishment of the Regulator, COAG further directed that the issues surrounding fatigue risk management were to be resolved and included in the National Law. Fatigue risk management requirements represent an area where national agreement could not previously be reached through development of the Model Law. As such, the Model Law is silent on the requirements for a fatigue risk management program and allowed for the states and territories to vary in their approaches.

Substantial progress was made in developing the National Law fatigue risk management provisions during 2010, with elements of the mandatory fatigue risk management program developed through extensive consultation and agreed by stakeholders. These agreed provisions are reflected in the National Law and were assessed in its accompanying regulatory impact statement (endorsed by SCOTI in November 2011).<sup>47</sup> The Regulator, administering the National Law, will be operational in 2013, although transitional provisions will provide existing rail transport operators additional time to achieve compliance.

#### 3.1 General duties

Rail transport operators have a general duty to ensure, so far as is reasonably practicable, the safety of railway operations.

The overarching requirements for an operator's obligations regarding fatigue risk management are provided in section 52(2)(d) of the National Law (Duties of rail transport operators), which imposes a duty on rail transport operators to "ensure, so far as is reasonably practicable that rail safety workers who perform rail safety work in relation to the operator's railway operations do not carry out rail safety work while impaired by fatigue or if they may become so impaired."

Despite any more specific requirements regarding fatigue risk management, the overarching duty applies and operators must comply with the performance-based regulatory approach.

#### 3.2 Mandatory requirement for a fatigue risk management program

Unless an exemption is granted, rail transport operators must be accredited by the Regulator prior to performing railway operations. The purpose of accreditation is for the operator to demonstrate to the Regulator its competence and capacity to manage risks to safety. This is generally demonstrated through the operator's safety management system.

A safety management system is the documented means by which rail transport operators demonstrate how they are meeting their duty to manage the safety of railway operations. The safety management system, like many other management systems, is founded on a cyclical process of planning, implementation, monitoring and review, and taking action to improve performance in the light of results. This process results in continuous improvement of the system and increasing achievement of the system objectives of safety of railway operations.

Among other things, section 99(2)(f) (Safety management system) of the National Law requires that the safety management system must mandatorily include a fatigue risk management program.

A fatigue risk management program is part of an overall framework for fitness for duty and a safe working environment for rail safety workers, their organisations and the general public. It is an integral part of a rail transport operator's safety management system that ensures that rail safety workers are not exposed to an unacceptable level of fatigue-related risk.

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<sup>47</sup> Rail Safety National Law and accompanying regulatory impact statement (November 2011), available at <http://ntc.gov.au/viewpage.aspx?Areald=34&DocumentId=1925>.



A rail transport operator “must prepare and implement a program, in accordance with the prescribed requirements, for the management of fatigue of rail safety workers who carry out rail safety work in relation to railway operations in respect of which the operator is required to be accredited that complies with the prescribed requirements relating to fatigue risk management programs” (section 116 (Fatigue risk management system) of the National Law).

### 3.3 Prescribed requirements for a fatigue risk management program

Consolidating previously disparate state and territory approaches under local variations, regulation 29 of the National Law includes consistent minimum requirements; these are intended to ensure that operators take into account the variety of risks in this complex area.

In preparing a fatigue risk management program an operator must take into account, and assess, any fatigue-related risks to safety arising from factors, including (but not limited to):

- the kind of work being undertaken – (for example whether tasks require high levels of physical exertion, concentration, or are highly monotonous)
- how work hours are scheduled (including breaks, relief, on-call and overtime scheduling) and the impact on performance and safety
- physiological factors arising out of work practices that affect rail safety workers, (such as effects on alertness and sleep patterns)
- the suitability of rest environments (including barracks, rest houses and relay vans)
- fatigue risks arising from one off events, (such as emergency situations)
- any relevant fatigue research or developments that may be able to be applied.

In addition to these considerations, an operator must establish and maintain documented procedures to manage fatigue-related risks, including:

- specified work scheduling practices that provide for hours of work and periods of time between shifts that are safe (that is, if the effect of implementing those hours or periods is sufficient to manage risks arising from fatigue so far as is reasonably practicable)
- suitable staffing arrangements for relief work
- procedures for monitoring the actual hours worked by rail safety workers (as opposed to those rostered), and monitoring the impact of changes to rosters
- providing information and education to rail safety workers.

The full requirements are provided in *Appendix A: Fatigue risk management program requirements*.

The extent of detail required for the various elements of the fatigue risk management program will be scalable commensurate with the results of the risk assessment undertaken, as with other aspects of safety management systems. The level of detail of a fatigue risk management program might vary for different workforce groups within an organisation, and among different sized organisations.

Operators are required to include specified work scheduling practices that provide for safe hours of work and safe periods of time between shifts (refer to subregulation (2)(a)(i) and (ii) of the National Regulation 29) within their fatigue risk management programs, therefore proposing a system of work. As it stands currently in the National Law, the scheduling of hours of work and rest is left to performance-based regulation based purely on an operator’s risk assessments.

### 3.4 Regulatory oversight

As discussed under *Section 3.2* above, rail transport operators must be accredited by the Regulator to perform railway operations, demonstrating competence and capacity to manage risks

to safety at the time of accreditation. Accreditation is essentially a threshold test in order for railway operations to commence.

At the time of accreditation (or variation of accreditation), the Regulator may impose conditions or restrictions on the operator.

The National Law provides the Regulator with various opportunities and powers to examine the safety management system. These powers and opportunities range from the opportunity afforded at the time of accreditation (or variation to accreditation) through to annual reviews and the ability to conduct audits or inspections of all or parts of an operator's program (which extends to the fatigue risk management programs that are applied by other organisations contracted to or otherwise working for the rail transport operator) as the focus shifts towards ongoing compliance.

In the event of the Regulator becoming aware of breaches of the law, it may issue improvement notices or, in extreme cases, prohibition notices.

Additionally, the rail transport operator is required to provide safety performance reports on its railways operations and to report notifiable occurrences (those occurrences with an impact on safety) to the Regulator, which in turn may trigger Regulator audit, inspection or investigation activities relating to an operator's fatigue risk management program. This provides the Regulator with the ability to provide continued oversight, and undertake compliance and enforcement action if warranted.

Pertaining to fatigue risk management in particular, a rail transport operator must notify the Regulator in writing of a proposed decision to change any work scheduling practices and procedures set out in the operator's fatigue risk management program at least 28 days before the date the operator intends to bring the change into effect (refer to regulation 9(1)(a) (Prescribed conditions and restrictions) of the National Regulations).

Furthermore, the operator must give the Regulator a written report of any breach of the work scheduling practices and procedures set out in the operator's fatigue risk management program within 72 hours after becoming aware of the occurrence (refer to regulation 40(b)(xv) (Reporting of notifiable occurrences) of the National Regulations).

As such, the Regulator is provided with a high degree of oversight, particularly over work scheduling practices, and is afforded various opportunities to work with rail transport operators to ensure ongoing compliance.

## **3.5 Other relevant provisions**

### **3.5.1 Consultation**

Safety management systems are not developed in isolation; the National Law includes mandatory requirements for consultation to occur

Before establishing a safety management system, the operator must, so far as is reasonably practicable consult with persons likely to be affected by the safety management system or its review of variation, being persons who carry out those railway operations, health and safety and union representatives of those persons and the public as appropriate (refer to section 99(3) (Safety management system) of the National Law).

These provisions ensure that relevant rail safety workers, or their representatives, are able to actively contribute to the procedures outlined in the safety management system, including the fatigue risk management program.

### **3.5.2 Obligations of rail safety workers**

Rail safety workers are also imparted with a duty to "comply, so far as the worker is reasonably able, with any reasonable instruction given by the rail transport operator to allow the operator to comply with [the law]" (refer to section 56(1)(c) (Duties of rail safety workers) of the National Law).

This duty on rail safety workers ensures their conformance with the operator's fatigue risk management program.

### **3.5.3 Exemption provisions**

Part 6 of the National Law includes processes for rail transport operators to gain exemption from all or some of the provisions of the National Law.

To account for circumstances in which an exemption is sought under pressing or urgent circumstances, Ministerial exemptions (refer to section 203 of the National Law) may be granted for up to three months from all or part of the National Law.

Most pertinent to the fatigue risk management provisions, is the ability for the Regulator to grant longer-term exemptions to individual rail transport operators from specific provisions of the National Law (refer to Division 2 of Part 6 of the National Law). This is achieved by the operator making an application to the Regulator based on the scope and nature of their railway operations. Such exemptions are restricted to certain sections of the National Law and elements of the safety management system, including the requirements of a fatigue risk management program. The granting of an exemption may be subject to conditions or restrictions; in this way the Regulator need not simply provide a full exemption, but has the ability to require a different level of compliance or alternative means of compliance based on the risk profile of a particular operator.

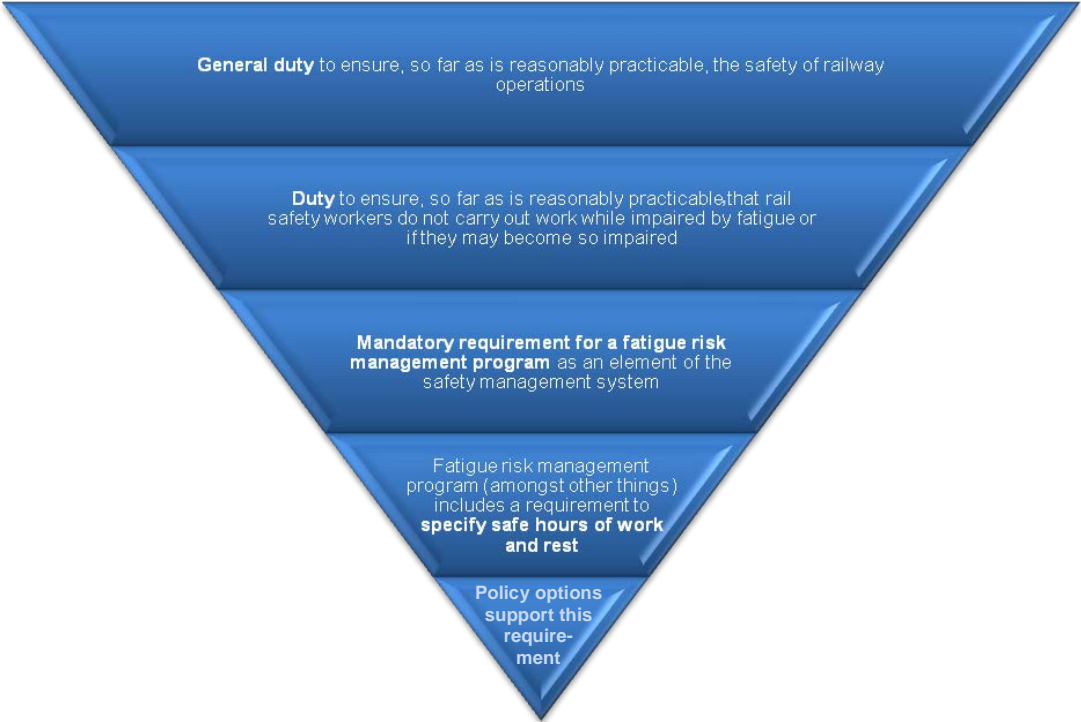
By reducing the degree of regulation for some railways commensurate to their level of risk, the exemption provision supports the key objectives of the reform, not reducing existing levels of rail safety, but streamlining regulatory arrangements and reducing the compliance burden for business.

## **3.6 Summary**

The general duty mirrors that imposed on all industries, whereby operators have a general duty under occupational health and safety legislation to protect the safety of their workers. Mechanisms such as safety management systems (and fatigue risk management programs within them) are directed towards the end goal of eliminating or managing risks to safety so far as is reasonably practicable.

As described, it is evident that fatigue risk management and various associated concerns are comprehensively addressed via the National Law. Consideration of whether the National Law should further regulate hours of work and rest for rail safety workers, placing limits around the risk management process and providing a 'safety net', is an outstanding policy matter addressed via this draft regulatory impact statement. *Figure 3* provides a visual representation of the already-established fatigue risk management provisions and how the policy options examined in this regulatory impact statement would integrate with these requirements to provide for the consistent regulation of fatigue risks in the rail sector.

**Figure 3. Hierarchy of fatigue risk management duties on rail transport operators**



## 4. Current regulation of hours of work and rest

### 4.1 Regulatory approaches to hours of work and rest in Australian rail safety laws

The various requirements for a fatigue risk management program (refer to *Section 3.3. Prescribed requirements for a fatigue risk management program*) do, by default, require a rail transport operator to establish its own specific rules around hours of work and rest for all rail safety workers commensurate to the risk profile of the particular organisation.

Nonetheless, with respect to whether a regulatory regime aimed at addressing fatigue risk management should regulate this aspect further and include limitations on maximum hours of work or minimum periods of rest, states and territories have disagreed.

There is no explicit section in the law for the provision of legislated maximum hours of work or minimum periods of rest for rail safety workers (often referred to as a 'safety net'). However, by empowering the Regulator in respect of working with operators to develop the detail in their safety management systems, the risk-based approach of the fatigue risk management program allows for such specific detail to be required of particular operations where the risk profile suggests this is appropriate.

The absence of specific requirements for a fatigue risk management program in the Model Law has seen individual state and territories vary in their approaches towards hours of work and rest. New South Wales fatigue risk management provisions incorporate maximum hours limitations as a 'safety net' within which the risk management process can operate, but restrict them to rail safety workers who drive trains. While other states and territories have not adopted this approach, Queensland has recently made regulations with provisions similar to those in New South Wales (transitional provisions within these regulations provide that the provisions do not apply to a train operator's railway operation until 11 February 2013).

Where there are no legislated hours of work, the approach to working time restrictions is solely through the normal risk management processes in all states and territories, with rail transport operators documenting policies and principles behind their rostering practices in their fatigue risk management programs under the oversight of regulators.

To support operators in developing their safety management systems, particularly in the absence of specific requirements, various tools, including standards and guidelines, are available to assist operators in achieving compliance. For example, in June 2008, NTC, with input from the Rail Safety Regulators Panel, Australasian Railway Association and Rail, Tram and Bus Union, released a Guideline on the management of fatigue in rail safety workers.<sup>48</sup> This guideline has since been endorsed by the ATC. The Guideline is intended to assist rail safety regulators, industry stakeholders and other relevant parties with duties under rail safety legislation to understand and comply with the legislative requirements in the Model Bill. Practical guidance is given in this document on establishing a fatigue risk management program and adopting a systematic, consultative approach to identifying, assessing, controlling and monitoring the risk factors associated with fatigue.

Further information on the various tools available to operators is included in *Appendix B: Regulatory and non-regulatory tools*.

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<sup>48</sup> National Transport Commission (2008). *National rail safety guideline: Management of fatigue in rail safety workers*. National Transport Commission, Melbourne, available at [http://www.ntc.gov.au/filemedia/Reports/NRSG\\_FatigueManagement\\_June2008.pdf](http://www.ntc.gov.au/filemedia/Reports/NRSG_FatigueManagement_June2008.pdf).

#### 4.1.1 The New South Wales approach

Following the Glenbrook and Waterfall rail accidents and issues following privatisation of the rail industry, which were resulting in excessive duty times, New South Wales adopted provisions with maximum working hours and minimum rest periods for rail safety workers who drive trains. These fatigue risk management provisions, set out in Schedule 2 to the *Rail Safety Act 2008* (NSW), supplement the risk-based approach established through the general duty and fatigue risk management program requirements.

The key requirements (which do not apply in the event of an accident, emergency or other unforeseeable circumstance that makes it necessary to contravene the schedule to avoid a serious dislocation of train services if there is no reasonably practicable alternative) are:<sup>49</sup>

##### 2 Working hours for rail safety workers driving freight trains

*The following conditions of work apply to rail safety workers who drive freight trains:*

- (a) In the case of a 2 person operation (where the second person is a qualified train driver, including a qualified train driver who is learning the route or undergoing an assessment), the maximum shift length to be worked is 12 hours.*
- (b) In the case of any other 2 person operation, the maximum shift length to be worked is 11 hours.*
- (c) In the case of a one person operation, the maximum shift length to be worked is 9 hours.*
- (d) In the case of a one person operation, there is to be a minimum break of not less than 30 minutes taken at some time between the third and fifth hour of each shift.*
- (e) There is to be a break of at least 11 continuous hours between each shift worked by a rail safety worker where the worker ends a shift at the home depot.*
- (f) There is to be a break of at least 7 continuous hours between each shift worked by a rail safety worker where the worker ends a shift away from the home depot and the break is taken away from the home depot.*
- (g) A maximum number of 12 shifts is to be worked in any 14-day period but a maximum number of 6 shifts of 12 hours is to be worked in any 14-day period.*

##### 3 Working hours for rail safety workers driving single manning passenger trains

*(1) The following conditions of work apply to rail safety workers who drive passenger trains in a one person operation:*

- (a) The maximum shift length to be worked is 10 hours for the driver of an interurban or long distance passenger train or 9 hours for the driver of a suburban train.*
- (b) There is to be a break of at least 11 continuous hours between each shift worked by a rail safety worker where the worker ends a shift at the home depot.*

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<sup>49</sup> *New South Wales Rail Safety Act 2008 No. 97, available at <http://www.legislation.nsw.gov.au/maintop/view/inforce/act+97+2008+cd+0+N>.*



- (c) *There is to be a break of at least 7 continuous hours between each shift worked by a rail safety worker where the worker ends a shift away from the home depot and the break is taken away from the home depot.*
  - (d) *A maximum number of 12 shifts is to be worked in any 14-day period.*
- (2) *The conditions of work set out in clause 2 (a), (b) and (e)–(g) apply to rail safety workers who drive passenger trains in a 2 person operation.*
- 4 *Train drivers who are transported to home depot or rest place*
- (1) *This clause applies to rail safety workers who drive trains and who travel to a home depot, or to a place provided for rest between shifts (a barracks), as passengers in a train or other vehicle provided by the rail transport operator.*
  - (2) *The following rules apply in relation to any such worker:*
    - (a) *the period between signing on for a shift and reaching the home depot or barracks must not exceed 16 hours,*
    - (b) *for the purposes of applying the requirements of clauses 2 and 3 in relation to length and number of shifts (and despite clause 1), time spent travelling to the home depot or barracks is not taken to be part of the shift worked,*
    - (c) *for the purposes of applying the requirements of clauses 2 and 3 in relation to breaks between shifts, the break between shifts commences when the worker reaches the home depot or barracks,*
    - (d) *any such worker must not undertake any rail safety work or drive any motor vehicle after commencing to travel to the home depot or barracks and before signing off at the home depot or barracks.*
  - (3) *Despite subclause (2), any such worker is for any other purpose taken to have been rostered on for a shift ending when the worker signs off at the home depot or the barracks.*

The limitations on hours of work and rest prescribed in the *Rail Safety Act 2008* (NSW) do not substitute for or otherwise impact on the standing obligation for operators to develop a fatigue risk management program, as required in other states and territories that do not restrict hours of work. The Independent Transport Safety Regulator (NSW) notes that these limitations are:<sup>50</sup>

*“...minimum standards and do not preclude shorter shifts or more frequent breaks. This means operators must determine what hours are appropriate for the particular operating conditions and the risks of the tasks undertaken by their rail safety workers who drive trains...”*

An operator can apply for an exemption from all or part of the requirements in Schedule 2 by applying to the Regulator pursuant to regulation 14 of the *Rail Safety (General) Regulations 2008* (NSW). Regulation 14 sets a number of conditions that must be satisfied so that the Regulator can be assured, in lieu of compliance with the prescriptive alternative, that an operator has thoroughly identified fatigue-related risks, implemented standards that effectively replace those in Schedule 2, has an active monitoring system that is also audited, and met other relevant requirements.

Full details of the New South Wales legislation are included in *Appendix C: New South Wales fatigue management provisions for rail safety workers who drive trains*.

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<sup>50</sup> New South Wales Independent Transport Safety Regulator. *Fatigue Management*, available at [http://www.transportregulator.nsw.gov.au/publications/fact\\_sheets/fatigue-management-fact-sheet](http://www.transportregulator.nsw.gov.au/publications/fact_sheets/fatigue-management-fact-sheet).

#### 4.1.2 The Queensland approach

Queensland made regulations on 2 February 2012, similar to those in New South Wales, which prescribe maximum hours of work and minimum periods of rest for rail safety workers who drive trains. Transitional provisions within these regulations provide that the provisions do not apply to a train operator's railway operation until 11 February 2013, which is after the proposed date for the commencement of the National Law (due by 1 January 2013). Regulatory compliance obligations at the time of implementation of the National Law in Queensland will not have been required to change; as a result, the analysis in this draft regulatory impact statement is based on current practice.

The making of the regulations was in response to concerns raised with the Queensland regulator by various interest groups, particularly new operators being accredited in that state, some engaging in practices that resulted in excessive fatigue risk arising from poor rostering or excessive shift lengths, and some operators not complying with relevant industrial agreements. The fatigue risk management provisions, set out in regulations 19-19S of the *Transport (Rail Safety) Regulation 2010* (QLD), supplement the risk-based approach established through the general duty and fatigue risk management program requirements.

The key requirements (which do not apply in the event of an accident, emergency or other unforeseeable circumstance that makes it necessary to contravene the schedule to avoid a serious dislocation of train services if there is no reasonably practicable alternative) are:<sup>51</sup>

##### *19B Standard work hours and rest periods*

- (1) This section applies if the train driver drives the train operator's train other than under an alternative work and rest hours approval.*
- (2) The length of the train driver's shift must not be more than—*
  - (a) if the driver drives a train as a one-driver operation for any period during the shift—9 hours; or*
  - (b) otherwise—12 hours.*
- (3) For subsection (2), the train driver drives a train as a one-driver operation for a period if the driver is the only person responsible for driving the train for the period.*
- (4) Also, if, during a shift, the train driver drives a passenger train on an urban journey, the driver must not spend more than 8 hours of the shift driving trains.*
- (5) The train driver's rest period must be at least—*
  - (a) 12 hours; or*
  - (b) if the driver's shift ending immediately before the rest period starts ended at an away depot—8 hours.*
- (6) In any 14 day period, the train driver—*
  - (a) must not carry out work in relation to railway operations in more than 12 shifts; and*
  - (b) must not carry out work in relation to railway operations for more than 132 hours.*
- (7) In this section—*

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<sup>51</sup> *Queensland Transport (Rail Safety) Regulation 2010 No. 1B*, available at <http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/T/TrantRailR10.pdf>.



**away depot**, for a train operator's train driver, means a place, other than the driver's home depot, provided or arranged by the operator as a place for the driver to rest between shifts.

**home depot**, for a train operator's train driver, means the work location identified as the driver's home depot in the driver's contract of employment, contract of training or contract for services.

**length**, of a shift of a train operator's train driver, means the time between when the driver signs on to start the shift and when the driver signs off to end the shift.

The Queensland approach to fatigue risk management predominately aligns with the New South Wales approach. The limitations on hours of work and rest prescribed in the *Transport (Rail Safety) Regulation 2010* (QLD) do not substitute for, or otherwise impact on, the standing obligation for operators to develop a fatigue risk management program, as required in other states and territories that do not restrict hours of work. The Queensland approach differs to the New South Wales approach in that the maximum number of hours, as opposed to maximum number of shifts alone, in any 14 day period is prescribed. With regard to the minimum rest period between shifts, at both the home depot and an away depot, are one hour longer than prescribed in the New South Wales approach (intended to recognise that not all the time spent between shifts is 'rest').

Consistent with the New South Wales approach, Queensland operators can apply for an exemption from all or part of the requirements in regulation 19 by applying to the Regulator pursuant to regulation 19F of the *Transport (Rail Safety) Regulation 2010* (QLD).

Transitional provisions within these regulations provide that the provisions above do not apply to a train operator's railway operation until 11 February 2013, which is after the proposed date for the commencement of the National Law. Further details of the Queensland legislation are included in *Appendix D: Queensland fatigue management provisions for rail safety workers who drive trains*.

## 4.2 Regulator assessment of hours of work and rest in practice

As discussed in *Section 3.4. Regulatory oversight*, the Regulator is provided with various opportunities and powers to examine the safety management system of an operator. These powers and opportunities range from the opportunity afforded at the time of accreditation (or variation to accreditation) through to annual reviews and the ability to conduct audits or inspections of all or parts of an operator's program as the focus shifts towards ongoing compliance.

The Regulator's role is to continually review, test and assess the operator's risk management process, rather than to actually approve (placing the obligation for risk management with industry). For the hours of work component of fatigue risk management, regulatory effort is focussed on reviewing the risk management process and an operator's rostering rules and principles (rather than actual rosters). Additionally regulators report that a major objective, particularly with respect to human factors risks, is to educate industry and improve the knowledge and culture amongst operators.

Consultation with regulators across the country has revealed variation in the level of capabilities and human factors resources available in each office. It is noted that the concepts of general duties and safety management systems based on operator risk assessments are still relatively new, and the understanding of these across the country is not consistent. This appears to have created variability in approaches between states and territories, with some offices favouring a more stringent approach and others favouring a more educative methodology with operators.

While regulators consistently require consideration of hours of work and rest, there appears to be diversity in the criteria and level of detail required, partially (but not only) due to differing legislation amongst states and territories currently.

It is noted that a key intent of the Rail Safety Regulator Project Office in establishing the Regulator and, indeed a benefit of the Regulator itself, is the up skilling of regulatory officers and promotion of nationally consistent competency in the area of human factors risk management. A coordinated and uniform approach under a National Regulator is likely to result in significant benefits in this area.

### 4.3 Industry approach to managing hours of work and rest

While this draft regulatory impact statement is primarily concerned with the regulatory amendments and their impacts, it is necessary to consider how industry (particularly where there are no prescribed limitations on hours of work) currently manages hours of work and rest for rail safety workers under the existing co-regulatory arrangements.

In practice, arrangements for managing fatigue in the Australian rail industry involve regulators, management and employees. They comprise a mixture of regulation (transport and occupational health and safety), industry-based initiatives, company policies and industrial negotiation between companies, employees and rail unions. The arrangements also involve standardised health assessment programs in the *National Standard for Health Assessment of Rail Safety Workers*.<sup>52</sup>

On the whole, operators approach fatigue risk management in a holistic sense, integrated with other risks (particularly human factors risks) in the safety management system, such as drug and alcohol and health and fitness management programs. This allows operators to balance fatigue risks with other risks that rail safety workers are exposed to. For example, track maintenance workers are more likely to be rostered for night work to avoid exposure to active train operations, daytime heat stress or fire risks from welding during the day; in this way, the risks due to fatigue are balanced against environmental risks and it is this overall risk that the operator is conscious of managing. Rostering is a process that encompasses fatigue risk management obligations, operational matters and compliance with industrial instruments (amongst other matters) considered in tandem with employee's preferences, well-being and social needs.

Consultation, confirmed by discussions with state and territory regulators, has revealed that there is great variability in the level of capabilities within industry, with the proficiency in risk management highly variable, not only pertaining to fatigue risk management programs, but across the safety management system. This highlights a shortage in skilled human factors and risk management resources across industry.

Generally (although not universally) larger, more sophisticated operators with in-house resources have superior abilities in this area. Smaller operators, such as tourist and heritage operators, lacking human factors expertise, are more likely to rely on simple formulas (such as '12 hours on, 12 hours off') rather than pursuing more complex (and perhaps efficient) controls or solutions.

In most railway operations, unions are involved in the negotiation of enterprise bargaining agreements and in rostering committees, which set rosters and the principles by which hours of work are managed. (A discussion on this matter is included in *Section 5.2.5. Industrial processes*.) While some, more sophisticated operators are taking a truly risk management approach towards developing their own rules and principles in response to their risk profile, there appears to be a heavy reliance on the industrial process to limit hours of work and rest for rail safety workers. This may be due to the fact that the industrial process is more conservative than the output of risk assessments under the requirements of rail safety law, or may indicate that risk management in this area is not being given due regard, or is seen as superfluous, due to the industrial process.

There is also significant reliance on bio-mathematical models (computer-based fatigue models) to assist operators in developing rosters. The reliance on these models has been an area of considerable concern for regulators, who have indicated a strong preference for such models to be used as a tool to assist risk management processes, rather than being solely relied on for fatigue risk management decisions.<sup>53</sup>

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<sup>52</sup> National Transport Commission (2009). *National Standard for Health Assessment of Rail Safety Workers*. National Transport Commission, Melbourne, available at <http://ntc.gov.au/viewpage.aspx?documentid=1669>.

<sup>53</sup> NSW Independent Transport Safety Regulator *Transport Safety Alert - Number 34 - Use of bio-mathematical models in managing risks of human fatigue in the workplace* outlines potential limitations of bio-mathematical models and has been mirrored in other states and territories since its release. Available at: <http://www.transportregulator.nsw.gov.au/rail/publications/tsas/Transport%20Safet>

The reliance on more prescriptive methods provided by industrial agreements and bio-mathematical models perhaps indicates that further education is required for industry with respect to risk management in this area of human factors.

While a substantial number of rail safety workers do perform standard hours, indicating that a 'safety net' could be designed which may add a level of protection without restricting operations, this is not universally the case. Train crews, guards and look-outs, particularly on suburban passenger networks, tend to be working to restricted roster provisions; infrastructure workers, on the other hand, are typically working longer hours, are more prone to delays and performing significant amounts of night work to provide separation between track crews and train operations.

As a further complicating factor, there is a great diversity in operations and operating environments across the country, which create differences in how individual operators manage hours of work and rest and produce diversity in actual hours worked. For example, in areas with significant engineering controls, such as Train Protection & Warning System (TPWS) or Automatic Train Protection (ATP), aimed at automatically activating brakes on trains and avoiding train-train collisions, or on closed suburban networks with no freight interaction, fatigue-related risks may be more effectively controlled. Vigilance systems and operator-specific engineering controls add further differences to the role of hours of work restrictions. Secondary employment issues are a significant concern for tourist and heritage operators, with a primarily volunteer workforce, and can also affect commercial operations.

As opposed to an metropolitan or inter-urban network, the operations of some enterprises, particularly amongst mining and grain transporters, is dependent on commercial demands and environmental factors, making rostering a challenging task and often leading to significant variation between planned (master rosters) and actual (dynamic rosters). Delays due to network congestion, rail safety worker shortages or emergency situations in any operation creates divergence in planned versus actual. While regulatory effort is focused primarily on the rules and principles that result in planned rosters at present, under National Law requirements, a retrospective analysis of this variation is mandated. Notwithstanding this, anecdotally there appears to be significant variation in actual rosters, bringing into question whether regulatory effort is better placed towards operator's relief and emergency management practices.

Overall, these factors combine and contribute to a great deal of variation in how industry approach the management of hours of work and rest for rail safety workers and pose considerable challenges for policy-makers in developing national policy in this area.

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[y%20Alert%20-%20Number%2034%20-%20Use%20of%20bio-mathematical%20models%20in%20managing%20risks%20of%20human%20fatigue%20in%20the%20workplace%20-%2027%20July%202010.pdf/at\\_download/file.](#)

## 5. Basis and structure of the regulatory impact statement

### 5.1 Scope and methodology

Following the decision to establish a Single National Rail Safety Regulator, COAG and ATC directed NTC to develop a body of rail safety national law (the National Law) to be administered by the Regulator. COAG further directed that the National Law be developed using the NTC Model Rail Safety Bill (2007) and Model Regulations (the Model Law) as the basis.<sup>54</sup>

The National Law resolved a number of policy matters where states and territories had varied from the Model Law or where the Model Law allowed for variations, as well as any amendments necessary to form a body of law that could be administered on a national level (such as a national scheme for accreditation). The regulatory impact statement, endorsed by the SCOTI on 4 November 2011, assessed the impacts, costs and benefits of amendments to the corresponding provisions of the Model Law (rather than rail safety law as implemented (in varied manner) by individual states and territories).<sup>55</sup> The exception to this was where the Model Bill specifically allowed for local variations or where there was no corresponding Model provision, in which case amendments were assessed against existing state and territory rail safety law.

The outstanding issue of whether the National Law should further regulate and place limits around hours of work and rest for rail safety workers as a 'safety net' is being considered in this draft regulatory impact statement, which effectively serves as an addendum to the regulatory impact statement endorsed on 4 November 2011. The requirements for a fatigue risk management program represent an area where the Model Law specifically allows for local variations (intended as an interim arrangement until national agreement was reached). Allowing local variations for this matter also gave rise to states and territories varying in the way in which their respective rail safety laws further regulated the hours of work and rest of rail safety workers, one state including limitations of hours of work and rest, for which there is no corresponding provision in the Model Law. In following with the methodology of the previous regulatory impact statement, this draft regulatory impact statement is concerned with the assessment of the regulatory options against equivalent provisions in existing state and territory rail safety law.

Furthermore, as an addendum to the regulatory impact statement endorsed on 4 November 2011, this draft regulatory impact statement does not reassess the fatigue risk management requirements in the National Law as considered in the previous regulatory impact statement; to do so would be to double-count the costs and benefits of such provisions. Instead, this draft regulatory impact statement is solely concerned with the matter of further regulating hours of work and rest for rail safety workers with the aim to examine options that supplement the already-established requirements in the National Law and form an integrated policy for the consistent regulation of fatigue risks in the rail sector.

The preparation and development of this draft regulatory impact statement has included significant preliminary analysis and consultation with a variety of stakeholders, the particulars of which are outlined in *Section 11. Consultation*.

Public comment is invited on the draft regulatory impact statement and the proposed option for the regulation of hours of work and rest for rail safety workers. Feedback will be considered in determining whether to further amend the draft proposal and National Law, recognising that further policy development may be required. Following this process, the final regulatory impact statement will be submitted to SCOTI for consideration in May 2012.

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<sup>54</sup> Available at <http://ntc.gov.au/viewpage.aspx?documentid=1667>.

<sup>55</sup> Rail Safety National Law and accompanying regulatory impact statement (November 2011), available at <http://ntc.gov.au/viewpage.aspx?Areald=34&DocumentId=1925>.

## 5.2 Assumptions and constraints

### 5.2.1 Defining the 'base case' or 'counterfactual'

In keeping with the methodology of the previous regulatory impact statement endorsed on 4 November 2011, the options contained in this draft regulatory impact statement have been assessed relative to a base case or counterfactual. In the case of the previous regulatory impact statement, this was taken to be the existing Model Law provision. However, given that the Model Law allowed for local variations in fatigue risk management requirements and had no provision for the further regulation of hours of work and rest, the base case is, in fact, those local variations. As such, the impacts of the options contained in this draft regulatory impact statement have been assessed against the corresponding provisions in existing state and territory rail safety laws.

Additionally, previous regulatory impact statements have assessed the costs and benefits of the establishment of a single national rail regulator and the National Law, which includes provisions relating to fatigue risk management. This draft regulatory impact statement, therefore, does not attempt to reassess the benefits of a national regulator or of existing fatigue risk management requirements considered in previous regulatory impact statements; to do so would be to double-count the costs and benefits.

As such, the base case or counterfactual for this regulatory impact statement must assume a number of factors to allow it to be solely concerned with the costs and benefits of the pertinent matter of further regulating and placing limitations around hours of work and rest for rail safety workers.

The following assumptions constitute the base case.

- The National Rail Safety Regulator is established and there is a national accreditation scheme in place.
- The National Law has been implemented. This includes the provisions of Regulation 29 (refer to *Section 3. Existing provisions for fatigue risk management in the National Law*).
- Existing state-based variations continue to exist in the way in which hours of work and rest for rail safety workers are further regulated.
  - This means that New South Wales has retained its restrictions of rail safety workers who drive trains, as set out in Schedule 2 to the *Rail Safety Act 2008* (NSW).

It is assumed that this will be implemented by introducing New South Wales rail safety law, which will apply in addition to the National Law.

Therefore, to operate in New South Wales, an operator will either have to:

- comply with Schedule 2 to the *Rail Safety Act 2008* (NSW) for any operations in that state, or
- seek an exemption from the provision.
- Other states and territories do not prescribe any limitations on hours of work or rest.<sup>56</sup>

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<sup>56</sup> Queensland made regulations on 2 February 2012, similar to those in New South Wales, which prescribe maximum hours of work and minimum periods of rest for rail safety workers who drive trains. Transitional provisions within these regulations provide that the provisions do not apply to a train operator's railway operation until 11 February 2013, which is after the proposed date for the commencement of the National Law (due by 1 January 2013). Regulatory compliance obligations at the time of implementation of the National Law in



The various options assessed in this draft regulatory impact statement have been assessed relative to the aforementioned situation.

The above assumptions allow for the consideration of limitations on hours of work and rest in isolation, without the risk of double-counting previously assessed costs and benefits of the Regulator and National Law. Additionally, this allows for the consideration of the impact of changes to existing state-based regulatory approaches.

### 5.2.2 Economic assessment

In order to quantify the impact of the presented options, Frontier Economics was commissioned to undertake an economic assessment based on a social cost–benefit analysis. Frontier Economics' findings are referenced throughout the regulatory impact statement, with the full details of the economic analysis presented in *Appendix G: Economic assessment – social cost-benefit analysis*. Through a consultative process conducted by NTC, industry members and rail safety regulators provided key data and significant input to support the completion of the economic analysis.

However, the economic assessment, while an essential component of the impact analysis, has intrinsic limitations to its scope. Some of the impacts are qualitative in nature and revolve around imprecise attributes such as confidence, certainty, equity and practicality. Although dollar values can partially be attributed to these qualities, they are not easily subject to quantification. They are, nonetheless, important elements to consider for policy development. These more qualitative impacts are explored in the text and should be considered in tandem with the economic analysis.

As with these qualitative aspects, some benefits, particularly safety benefits as they may relate to reduced levels of fatigue and fatigue-related accidents and incidents, are equally problematic to quantify or even describe. There are a number of reasons for this.

- Due to the relatively few accidents and incidents that occur on railway systems (often low-frequency, high-consequence events), it is difficult to draw trends attributable to any single regulatory amendment (such as, amended fatigue risk management provisions).
- Establishing a causal connection between changes in practices (that result from changes in the form of regulation) to changes in risk is problematic.
- Where accidents and incidents have occurred, and while fatigue may be implicated, it remains difficult to isolate fatigue as a causal factor.<sup>57</sup> <sup>58</sup> Fatigue is often a contributing factor rather than the principal cause of incidents and, as such, there are often various other safety and non-safety factors involved, the dominance of which is often impossible to identify.
- The effects of fatigue are more nebulous than, for example, engineering malfunctions and therefore more challenging to detect and attribute to an incident.

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Queensland will not have been required to change; as a result, the analysis in this draft regulatory impact statement is based on current practice. A unanimous decision by Ministers on a nationally consistent approach (under an option presented in this draft regulatory impact statement) will supplant existing state and territory approaches, as the enactment of the National Law will replace existing state and territory legislation.

<sup>57</sup> Mitler MM, Carskadon MA, Czeisler CA, Dement WC, Dinges DF and Graeber RC (1988). *Catastrophes, sleep, and public policy: Consensus report*. *Sleep* 11(1):100-109.

<sup>58</sup> Mitler MM, Dinges, DF and Dement WC (1994). *Sleep, medicine, public policy, and public health*. In Kryger MH, Roth T and Dement WC (eds.) (1994), *Principles and practice of sleep medicine* (2nd ed.). W.B. Saunders, Philadelphia (pp. 453-462).

- Fatigue is often under-reported by those involved in accidents and incidents.
- It is impractical to consider fatigue risk management in isolation from safety management generally. A change in practice that might improve fatigue outcomes may have offsetting impacts on other aspects of safety management. For example, a shift from night to day shifts for track workers can improve fatigue outcomes, but can also increase their exposure to other hazards, such as environmental factors.
- There is variability in the way in which fatigue affects individuals and fatigue itself cannot be quantified accurately. Fatigue has been linked to degraded operational performance and simulator studies have indicated that train drivers may unwittingly undertake practices (speed or brake applications) that increase risks, or modify driving behaviour to offset the effects of fatigue by driving less efficiently.<sup>59</sup> However, the extent by which regulatory amendments may reduce rail safety worker fatigue cannot be directly quantified.
- Given the above difficulties, there is no quantified evidence currently available to suggest that differences in the form of regulation (specifically, between less and more prescriptive approaches) have an impact on fatigue-related risks.

Further discussion of these matters and data constraints is included in *Appendix G: Economic assessment – social cost-benefit analysis*.

### 5.2.3 Interpretation by the Regulator

It is important to note that this draft regulatory impact statement is concerned solely with the impacts of the regulatory options. How the Regulator would administer the regulatory options and how it would regulate compliance with the law is a matter that is subjective and cannot be addressed through this process.

The distinctions between legal and operational impacts, however, are not always precisely delineated; what is operationally practical will impact legal frameworks and vice versa. Therefore, some of the options proposed in this regulatory impact statement may have higher or lower impacts depending on how they are administered.

This is further compounded by the fact that the majority of provisions contained in the National Law do not prescribe precise outcomes, requiring instead that rail transport operators 'ensure, so far as is reasonably practicable, the safety of the operator's railway operations'. Where there are questions, confusion or disagreement over what constitutes minimum compliance standards, it is the Regulator that plays the major role in resolving them. Although Part 7 (Review of decisions) of the National Law provides operators with the ability to challenge decisions of the Regulator, in practice this option has tended to be utilised infrequently.

As a corollary, each option has been assessed as if it were to be complied with strictly. For the purposes of an impact analysis, it has been assumed that compliance is mandatory as it is not feasible to estimate the extent to which operators may gain exemption to the requirements. This assumption affects the assessment of Options 3 and 4, the frameworks for which could be included in a variety of regulatory instruments, but have been assumed to be expressed in strong legislative instruments for the purpose of assessment.

### 5.2.4 Overlap with Work Health and Safety Law

Rail transport operators are required to comply with rail safety, as well as work health and safety law.<sup>60</sup> Due to the significant overlap between these two bodies of law, it may be argued that the

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<sup>59</sup> Dorrian J, Roach GD, Fletcher A and Dawson D (2006). *The effects of fatigue on train handling during speed restrictions*. Transportation Research Part F: Traffic Psychology and Behaviour, 9(4):243–257.

<sup>60</sup> It should be noted that If a provision of the National Law is inconsistent with a provision of occupational health and safety legislation, the provision of the



regulatory impact of rail safety law is reduced to the extent that any duties are duplicated in work health and safety law.

There is an inherent difficulty in proportionately attributing the impact of rail operations between both bodies of law. Therefore, options in this draft regulatory impact statement have been assessed, as far as possible, by assessing the extent to which they would cause changes to rail operations and its regulation, and measuring the resulting costs and benefits.

### **5.2.5 Industrial processes**

The National Law is concerned solely with rail safety and the policy options presented have been assessed with this and the objectives of the national reform in mind (refer to *Section 7. Objectives*). It is noted, however, that the subject of limiting hours of work and rest for rail safety workers is a matter that overlaps with similar matters addressed via industrial processes.

Industrial agreements (being agreed outcomes between employers and employees) negotiated under the Commonwealth *Fair Work Act 2009* and rostering committees do address safety, but are also the mechanisms by which the multitude of other considerations, such as the family, social, work/life balance, and staff productivity aspects that impinge upon working time arrangements, are managed.

As with the variety of other law that rail transport operators must also comply with (including work, health and safety law), operators must too comply with the *Fair Work Act 2009*, other state-based industrial instruments, awards and enterprise bargaining agreements as well as the National Law. It should be noted that the *Fair Work Act 2009* contains provisions that override state laws to the extent that they are inconsistent with the Act.

In needing to comply with industrial agreements, working hours may be limited further than what is accommodated in the National Law for safety purposes under the options examined in this draft regulatory impact statement. For example, where a rail transport operator may not be limited from scheduling a sequence length of 12 shifts for a given rail safety worker under the National Law, but where an enterprise bargaining agreement for the relevant rail safety worker specifies a maximum sequence length of 10 shifts, the rail safety worker would only be required to work a maximum sequence length of 10 shifts or the operator will be in breach of the industrial agreement.

Despite any limits proposed under rail safety legislation, the industrial processes will still continue as it does presently. That said, it is recognised that there is the potential for limits proposed under the National Law to have an impact on the industrial bargaining process. As industrial agreements and their contents are re-negotiated over time, any limits present in the National Law may form a reference point for negotiation between workers and employers or may alter the relative bargaining power of the parties in question. This may serve to strengthen the industrial process where, for example, the National Law is more comprehensive or more conservative, or it may serve to weaken that process where the National Law is more lenient. However, it is not feasible to address this aspect in this draft regulatory impact statement, as there is insufficient evidence to appropriately assess whether the National Law will, in fact, impact the industrial process or the magnitude of that impact.

As such, the industrial instruments, as they currently stand at the time of preparation of this document, are taken to continue to be in place. There is recognition of the fact that, where industrial agreements may currently be the limiting factor and where their re-negotiation over time extend hours of work, there may be productivity benefits for operators that have not been included in the economic assessment of the options in question.

### **5.2.6 Fatigue risk management as distinct from fatigue management**

Finally, it is important to note that the National Law is concerned with fatigue-related risks to safety, as opposed to rail safety worker fatigue itself, the former taking into account the consequences of

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occupational health and safety legislation prevails to the extent of any inconsistency.

the hazard. This is an important distinction. While one method of controlling fatigue-related risks to safety is to manage fatigue directly, it is also possible for fatigue-related risks to be effectively managed via other controls, such as engineering controls, designed to mitigate the effects of an impaired worker (examples include vigilance devices or automatic train protection).

As such, the analysis contained in this regulatory impact statement addresses the costs, benefits and impacts of the various options on the management of fatigue-related risks to the safety of rail operations. The potential downstream effects of rail safety worker fatigue, such as the impact on health and the healthcare system, are not relevant to the analysis. Additionally, as previously discussed (refer to *Section 5.2.2. Economic assessment*), the extent by which regulatory amendments may reduce rail safety worker fatigue cannot be directly quantified.

## 6. Nature of the problem

A proportion of the rail industry has operations in multiple states and must contend with differing requirements and interpretations for fatigue risk management in each state for this area of the safety management system. Managing these local variations adds to the compliance costs of rail transport operators, duplicating efforts or reworking proposals to suit the differing demands in each state or territory. This may impede economic activity and create inefficiency, potentially diverting resources away from business efficiency and operational safety activities.

In response, COAG directed that the National Law address policy matters where states and territories had varied from the Model Bill and that the issues surrounding fatigue risk management were to be resolved and included in the National Law. The fatigue risk management requirements represent an area where national agreement could not previously be reached and where states and territories have adopted differing approaches.

In order to achieve national consistency in this area, it is necessary to resolve the final outstanding matter; that is, whether the National Law should further regulate hours of work and rest for rail safety workers. The debate has centred on the provision of a 'safety net' with respect to rail safety worker hours of work and rest, essentially whether the risk-based approach should operate within outer boundaries.

Further to the COAG requirement, it should be recognised that fatigue risk management and the regulation of hours of work and rest is an area of increasing focus.

The Australian rail industry is undergoing fundamental changes to its structure, ownership and competitive position in the provision of land transport services. Operators are extending services beyond historical boundaries and integrating them with road and shipping operations. Many of these changes have impacted on traditional work practices including shift lengths and rostering of workers, focusing attention on fatigue as a workplace safety issue.

Fatigue has been linked to degraded operational performance and has been identified as a contributing factor in accidents and incidents in railway systems and in other industries. It remains difficult to quantify the extent to which fatigue is a causal factor in most incidents; while fatigue may be implicated, it is often a contributing factor rather than the principal cause and, as such, there are often various other safety and non-safety factors involved, the dominance of which is often impossible to identify.

In addition, simulator studies have indicated that train drivers may unwittingly undertake practices (speed or brake applications) that increase risks, or modify driving behaviour to offset the effects of fatigue by driving less efficiently, making this an area of commercial interest beyond simply safety.<sup>61 62 63</sup>

The nature of the rail industry and its working requirements is such that fatigue is a complex risk and has been the focus of attention over the past decade or more. A significant amount of research has been undertaken on the effects and management of fatigue in the transport sector. A well-formed platform of knowledge and practical experience in managing fatigue-related risks has developed in the rail industry over time. In keeping with research and operational trends in safety

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<sup>61</sup> Dorrian J, Roach GD, Fletcher A and Dawson D (2006). *The effects of fatigue on train handling during speed restrictions*. Transportation Research Part F: Traffic Psychology and Behaviour, 9(4):243–257.

<sup>62</sup> Mitler MM, Carskadon MA, Czeisler CA, Dement WC, Dinges DF and Graeber RC (1988). *Catastrophes, sleep, and public policy: Consensus report*, Sleep 11(1):100-109..

<sup>63</sup> Mitler MM, Dinges, DF and Dement WC (1994). *Sleep, medicine, public policy, and public health*. In Kryger MH, Roth T and Dement WC (eds.) (1994), Principles and practice of sleep medicine (2nd ed.). W.B. Saunders, Philadelphia (pp. 453-462).

regulation, there has been a general (if not universal) shift from purely prescribed approaches focused on working hours to a more systematic approach to managing fatigue-related risk.

However, the shift towards risk-based approaches has not been complete or without its own issues. Hours of service restrictions are currently used in New South Wales and a similar system is proposed to take effect from February 2013 in Queensland, as some parties view the absence of any limitations on working hours as potentially leaving rostering practices open to exploitation. In general, however, consultation has revealed that rail transport operators are not presently compelling rail safety workers to undertake excessive working hours, which may indicate that current arrangements are not ineffective.

Whilst the general trend in international rail settings and in other transport industries has again been to move away from reliance on traditional prescriptive working time restrictions, such restrictions still play a pivotal role in many industries, including heavy vehicle regulation in Australia (refer to *Appendix E: Fatigue risk management practices in rail internationally*).

For these reasons, beyond simply the COAG requirement, consideration of the options for regulating hours of work and rest in the National Law is regarded as necessary.

Notwithstanding the above advice, it should be acknowledged that the Australian rail industry has a strong safety record, with relatively few accidents and incidents. While it is recognised that fatigue is sometimes implicated, there is a lack of conclusive evidence to indicate that fatigue is a major issue in Australian rail. It is therefore impractical to meaningfully determine the size of the 'fatigue problem' if one, in fact, exists.

## 7. Objectives

COAG agreed to establish a single national rail safety regulator, resolving that:<sup>64</sup>

*“These national arrangements will remove inefficiencies arising from inconsistent jurisdictional requirements, streamline the regulatory arrangements and thus reduce the compliance burden for business, and reduce transport costs more generally. Importantly, the efficiencies to be gained in moving to national transport safety regimes will not compromise safety. In fact, the better assessment of risk and more efficient allocation of resources through a national scheme will improve the safety of these key transport sectors.”*

In December 2009, COAG reiterated the need for a truly national transport system that will reduce transport costs and help lift national productivity without compromising safety.<sup>65</sup>

Accordingly, the overall objectives of this reform are to develop a body of uniform rail safety national law that:

- supports a seamless national rail transport system
- does not reduce existing levels of rail safety
- streamlines regulatory arrangements and reduces the compliance burden for business
- improves national productivity and reduces transport costs generally.

In meeting the above objectives, a key challenge for developing uniform National Law is to allow for adequate flexibility in accommodating genuine differences in the operating environments of states and territories and variations in rail safety worker job functions. A fundamental requirement is therefore to provide the Regulator with sufficient latitude to account for such differences. To address this diversity, the co-regulatory approach is broadly agreed to represent best practice and was endorsed by COAG in a recent regulatory impact statement.<sup>66</sup> A key objective is therefore to preserve the co-regulatory approach of the National Law.

More specifically, the objective of this policy process and draft regulatory impact statement is to determine nationally consistent provisions for the regulation of hours of work and rest for rail safety workers, thereby resolving variations present in existing state and territory legislation.

In doing so, with the objective of achieving consistency, an opportunity exists to review the variances in the laws of each state and territory and to develop regulatory requirements that represent best-practice management of fatigue risks as they relate to hours of work and rest for rail safety workers. However, in achieving improved safety, the regulatory framework should not be more stringent than necessary to achieve the desired policy outcomes; requirements should not unduly restrict flexibility, innovation or continuous improvement in fatigue risk management practices by rail transport operators.

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<sup>64</sup> Council of Australian Governments’ Meeting outcomes, available at [http://www.coag.gov.au/coag\\_meeting\\_outcomes/2009-07-02/index.cfm](http://www.coag.gov.au/coag_meeting_outcomes/2009-07-02/index.cfm).

<sup>65</sup> Council of Australian Governments’ Meeting outcomes, available at [http://www.coag.gov.au/coag\\_meeting\\_outcomes/2009-12-07/index.cfm](http://www.coag.gov.au/coag_meeting_outcomes/2009-12-07/index.cfm).

<sup>66</sup> National Transport Commission (2009). *Single, National Rail Safety Regulatory and Investigation Framework: Regulatory Impact Statement (Volume 1)*. National Transport Commission, Melbourne, available at <http://www.ntc.gov.au/viewpage.aspx?documentid=1927>.

## 8. Options

This draft regulatory impact statement explores the impacts, costs and benefits of the various options for the further regulation of hours of work and rest for rail safety workers beyond the requirements of Regulation 29 of the National Regulations (refer *Section 3. Existing provisions for fatigue risk management in the National Law*).

The debate amongst states and territories has centred on the provision of a 'safety net' with respect to rail safety worker hours of work and rest; essentially whether the risk-based approach should operate within prescribed outer boundaries or not. The options assessed represent attempts to reconcile the diverging positions on this matter.

The base case or counterfactual retains the existing state-based variations on the issue of hours of work and rest. Options 1 and 2 represent nationally consistent arrangements based on the different state-based approaches currently in force in Australian rail safety legislation. Options 3 and 4 represent regulatory options that operationalise advice provided by the Expert Panel and subsequent recommendations of the Fatigue Academic Working Group, experts commissioned specifically to support this policy process.

Under all options, the requirements of the existing provisions in the National Law, including Regulation 29 of the National Regulations, will continue to apply. That is, operators will still be required to meet the overarching duties for safety and fatigue risk management, maintain fatigue risk management programs and operate the systems required to sustain them, and the Regulator would need to assess them. As such, all options discussed supplement these overarching requirements as opposed to supplanting them.

### 8.1 Base case or counterfactual

The following assumptions constitute the base case.

- The National Rail Safety Regulator is established and there is a national accreditation scheme in place.
- The National Law has been implemented. This includes the provisions of regulation 29 (refer *Section 3. Existing provisions for fatigue risk management in the National Law*).
- Existing state-based variations continue to exist in the way in which hours of work and rest for rail safety workers are further regulated.
  - This means that New South Wales has retained its restrictions of rail safety workers who drive trains, as set out in Schedule 2 to the *Rail Safety Act 2008* (NSW).

It is assumed that this will be implemented by introducing New South Wales rail safety law, which will apply in addition to the National Law.

Therefore, to operate in New South Wales, operator will either have to:

- comply with Schedule 2 to the *Rail Safety Act 2008* (NSW) for any operations in that state
- seek an exemption from the provision
- Other states and territories do not prescribe any limitations on hours of work or rest.<sup>67</sup>

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<sup>67</sup> Queensland made regulations on 2 February 2012, similar to those in New South Wales, which prescribe maximum hours of work and minimum periods of rest for rail safety workers who drive trains. Transitional provisions within these

As the base case, this situation is the benchmark by which the options are assessed.

## **8.2 Option 1 – No prescribed hours of work/rest are included in the National Law**

Option 1 stipulates that no prescribed maximum hours of work or minimum periods of rest are included in the National Law. This signifies no change to the National Law and National Regulations as they were endorsed by SCOTI on 4 November 2011, the requirements of which are detailed in *Section 3. Existing provisions for fatigue risk management in the National Law*.

This option represents a change to the law as it applies in New South Wales only, with removal of existing legislated hours of work and rest for train drivers. This will have no effect on the regulatory arrangement in other states and territories relative to the baseline.

## **8.3 Option 2 – New South Wales arrangements are included in the National Law (applied nationally)**

Option 2 involves extending the arrangements in place in New South Wales to other states and territories. Maximum hours of work and minimum periods rest for rail safety workers who drive trains would be prescribed in the National Law as per *Appendix C: New South Wales fatigue management provisions for rail safety workers who drive trains*.

This option would therefore not impose any change on the regulatory arrangements in place in New South Wales relative to the baseline. However, prescribing maximum hours of work for train drivers would represent a change in all other states and territories. Any existing operations in those states and territories where planned rosters extend beyond the prescribed requirements will either need to conform or apply for an exemption (as is provided for by regulation 14 of the *Rail Safety (General) Regulations 2008 (NSW)*).

## **8.4 Option 3 – Simplified risk-based approach to limiting hours of work and rest**

This option requires the Regulator to apply a specified assessment framework (during accreditation or variation of the fatigue risk management program, including when operators propose a change to any work scheduling practices and procedures set out in the fatigue risk management program) to determine the fatigue-related risk associated with operators' rostering.

The framework specifies 'outer limits' or minimum periods of intra-shift, inter-shift and inter-sequence breaks. The framework is intended to guide operators on the need to put additional controls in place to mitigate these risks. The point at which these additional controls would be needed is specified, although the form of the control required is not mandated.

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regulations provide that the provisions do not apply to a train operator's railway operation until 11 February 2013, which is after the proposed date for the commencement of the National Law (due by 1 January 2013). Regulatory compliance obligations at the time of implementation of the National Law in Queensland will not have been required to change; as a result, the analysis in this draft regulatory impact statement is based on current practice. A unanimous decision by Ministers on a nationally consistent approach (under an option presented in this draft regulatory impact statement) will supplant existing state and territory approaches, as the enactment of the National Law will replace existing state and territory legislation.



This framework would apply to all rail safety workers (unlike Option 2) and operators/duty-holders in all states and territories. Unlike Option 4, differences in the consequences of fatigue for the different rail safety workers are not considered.

Under this option it is proposed that operators/duty-holders will take the following steps when developing, reviewing or amending their fatigue risk management program component relating to hours of work and rest for rail safety workers prior to applying for accreditation/variation to accreditation or notifying the Regulator of a change, as appropriate.

- (a) Using the established risk-based approach within the National Law (and consistent with current practice), determine 'safe hours of work and rest for rail safety workers', taking into account all factors specified in the National Regulations (refer *Section 3. Existing provisions for fatigue risk management in the National Law*). This may take the form of individual rosters or rostering rules/principles for classes or categories of rail safety worker.
- (b) Having undertaken a risk assessment as per the above, propose risk controls appropriate to the risk profile and nature of the operations.
- (c) The work scheduling practices, procedures or individual schedules determined in step (a) would then be assessed against the risk measures in *Table 2*. Using this table, it is possible to identify the level of risk controls that would be required.

Any feature of a planned roster falling into the outer limit would require amendment (emergency situations could be accommodated during operations if there was no reasonably practical alternative arrangement).

- (d) Having determined the level of controls appropriate, the operator can make a judgment (with reference to the examples in *Table 3*) as to whether its proposed risk controls are appropriate or whether additional controls would be required.

**Table 2. Work schedule risk assessment tool**

Dimension	Measure/risk factor	Unit	Standard Controls	Additional controls	Significant additional controls	Outer limit
<b>Intra-shift breaks</b>	Time-off-task breaks	% of total shift	More than 13%	13-10%	10-8%	Less than 8%
	Time-on-task between breaks	Max. no. of hours	Less than 3	3-4	4-5	More than 5
<b>Inter-shift breaks</b>	Total sleep opportunity <i>(sleep opportunity in 7-day period)</i>	No. of hours	More than 120	120-105	104-84	Less than 84
	Subsequent sleep opportunities <i>(total sleep opportunity in consecutive 2-day (48hour) period)</i>	No. of hours	24	23	22	Less than 22
	Single sleep opportunity <i>(sleep opportunity in 1-day period)</i>	No. of hours	12	11	10	Less than 10
	Sleep opportunity is during the day <i>(between</i>	% of shifts	0	0-50	50-100	n/a

	0600-2200 hours)					
<b>Inter-sequence breaks</b>	Length of sequence	No. of shifts	1-5	6-7	8-12	More than 12
	Sequence includes night work (between 2200-0600 hours)	No. of shifts	0	1-3	4-7	More than 7

Brief definitions of the specific factors considered follow and the detailed scientific rationale behind the table and proposed limits is included in *Appendix F: Fatigue Academic Working Group evidence base*.

### ***Intra-shift breaks***

Intra-shift break periods are where an employee is provided respite from their work task. Such a break permits an employee time to shift focus away from their primary task and recover from the physical or mental demands of the task. The breaks are used to divide up the shift into sustainable periods of time-on-task and time-off-task to ensure attention can be sustained at a safe level.

It is important to note that concept of 'breaks' as used in this option may not always be the same as is the case for the purpose of 'breaks' defined within industrial agreements.

Firstly, it is possible for a 'time-off-task' break to occur within the work period and not during a designated 'break'. For example, if a train driver is required to stop somewhere and wait 10 minutes before proceeding, then the time spent waiting may not require sustained attention and can be considered 'time-off-task'.

Secondly, maintaining continuous concentration on a single task may lead to performance degradation; a mix of tasks, or swapping between two different tasks may provide the necessary respite, even if it not accompanied by a designated 'break'.

Safe operations therefore require an operator to look at the duration and intensity of cognitive workload across the shift and to ensure that the pattern of time-on- and off-task will enable the employee to maintain a safe level of performance across the entire shift.

### ***Inter-shift breaks***

Inter-shift breaks are break periods between subsequent shifts and should provide employees with sufficient opportunity to be considered fit-for-duty at the start of each shift across a sequence of shifts. There are four key determinants of whether inter-shift breaks are sufficient to achieve this:

- total sleep opportunity: the total amount of time available as a sleep opportunity in any given seven-day period
- subsequent sleep opportunities: the total sleep opportunity in any given, consecutive two-day period
- single sleep opportunity: sleep opportunity in any given 24-hour period
- whether sleep can be taken at night when it is of most benefit.

### ***Inter-sequence breaks***

Inter-sequence breaks are the longer break periods between a given sequence of shifts, in addition to shorter inter-shift breaks, and are typically more than 32 hours in length. The length and frequency of inter-sequence or 'reset' breaks required to manage fatigue related risk are influenced by the number of shifts between reset breaks and number of night shifts within a work pattern.

The outer limits in *Table 2* provide a 'safety net' to prevent excessive risk. Additionally, *Table 2* provides a guide for the timing and degree of additional controls that would be required to manage the risk of fatigue generated by an operator's work scheduling practices, procedures or individual schedules.

Work schedules that exceed the parameters for standard controls are likely to lead to or contribute to fatigue. The further a work schedule diverges from the standard working arrangements in any parameter, the more likely it is to present a fatigue risk and therefore increasing controls will be required to mitigate that risk.

**Table 3. Examples of minimum control requirements<sup>68</sup>**

		Standard controls	Additional controls	Significant additional controls
<b>Engineering controls</b>	As appropriate	✓	✓	✓
<b>Fatigue-related training and education</b>	Individual level	✓	✓	✓ Competency based
	Scheduling staff		✓	✓ Competency based
	Fatigue manager			✓ Competency based
<b>Fatigue analysis and monitoring controls</b>	Prospective schedule analysis	✓	✓	✓
	Retrospective schedule analysis	✓	✓	✓
	Aggregate prior sleep/wake reports		✓	✓
	Individual prior sleep/wake reports			✓
	Behavioural checklists reports			✓
	Prospective focus groups		✓	✓
	Retrospective focus groups			✓
<b>Fatigue mitigation controls</b>	Short rest break and or napping strategies.		✓	✓
	Alertness monitoring technologies		✓	✓
<b>Incident management controls</b>	Error management and analysis			✓
	Incident reporting	✓	✓	✓
	Incident analysis that focuses on fatigue as a contributory factor		✓ Incident types	✓ Individual incidents

### ***Legislative instrument***

In terms of the legislative instruments available under the framework of the National Law, Option 3 could be encompassed in the National Law (Act or Regulations) itself, an approved code of practice or guidance material. A discussion of each of these instruments and their impact of compliance is included in *Appendix B: Regulatory and non-regulatory tools*.

<sup>68</sup> Note that these controls are examples only; operators should assess risk control measures as appropriate to the risk profile and the scope and nature of their operations.

For the purposes of an impact analysis, it should be assumed that compliance is mandatory (as it is not feasible to estimate the extent to which operators may gain exemption to the requirements). As such, it is assumed that the framework is included in a strong legislative instrument; in this case, this would be either the National Law itself or an approved code of practice.

## **8.5 Option 4 – Risk-based approach to limiting hours of work and rest with consequence-based categorisation of rail safety workers**

Like Option 3, Option 4 requires the Regulator to apply a specified assessment framework (during accreditation/variation of the fatigue risk management program, including when operators propose a change to any work scheduling practices and procedures set out in the fatigue risk management program) to determine the fatigue-related risk associated with operators' rostering.

The framework specifies 'outer limits' or minimum periods of inter-shift and inter-sequence breaks. Unlike Option 3 however, intra-shift breaks are not considered within the matrix.

Like Option 3, this framework applies to all rail safety workers and operators/duty-holders in all states and territories. However, under Option 4 operators are required to categorise their different classes of rail safety workers based on the consequences that may emerge should their performance be degraded by fatigue. This assessment results in an additional set of 'aggregate outer limits' for each worker category that relates to the combinatorial risks associated with the proposed inter-shift and inter-sequence breaks.

The framework is intended then to guide operators on the need to put additional controls in place to mitigate these risks. The point at which these additional controls would be needed is specified, although the form of the control required is not mandated.

Under this option it is proposed that operators/duty-holders will take the following steps when developing, reviewing or amending their fatigue risk management program component relating to hours of work and rest for rail safety workers prior to applying for accreditation/variation to accreditation or notifying the Regulator of a change, as appropriate.

- (a) Using the established risk-based approach within the National Law (and consistent with current practice), determine 'safe hours of work and rest for rail safety workers', taking into account all factors specified in the National Regulations (refer *Section 3. Existing provisions for fatigue risk management in the National Law*). This may take the form of individual rosters or rostering rules/principles for classes or categories of rail safety worker.
- (b) Undertake an assessment of the fatigue-related consequences for the classes of rail safety worker employed, as outlined in *Figure 4* (modelled from the *National Standard for Health Assessment of Rail Safety Workers*).<sup>69</sup>
- (c) Having undertaken a risk-assessment as per the above, propose risk controls appropriate to the risk profile and nature of the operations.
- (d) The work scheduling practices, procedures or individual schedules determined in step (a) would then be assessed against the risk measures in *Table 4*. The output of that process is the determination of a 'fatigue likelihood' score. The scores obtained for any feature of the work pattern that fall in the '+1' or '+2' score columns are summed to give the total fatigue likelihood score for the pattern of work.

Any feature of a planned roster falling into the outer limit would require amendment (emergency situations could be accommodated during operations if there was no reasonably practical alternative arrangement).

- (e) The fatigue likelihood score is then used in *Table 5*, linking the likelihood score determined in step (d) to the consequence category determined in (b) to determine a risk level.

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<sup>69</sup> National Transport Commission (2009). *National Standard for Health Assessment of Rail Safety Workers*. National Transport Commission, Melbourne, available at <http://ntc.gov.au/viewpage.aspx?documentid=1669>.

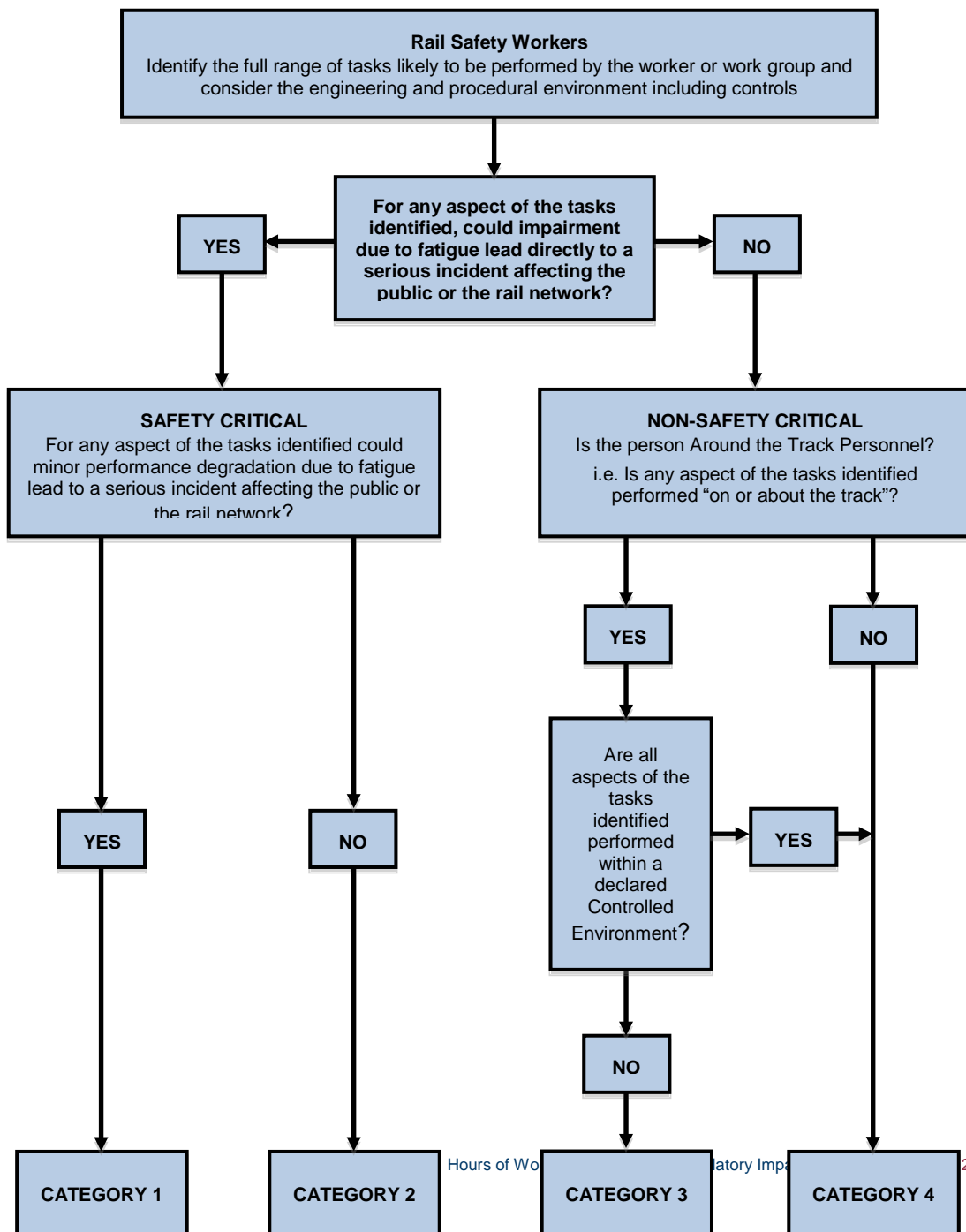
- (f) Having determined a risk level, the operator can make a judgment (with reference to the examples in *Table 6*) as to whether its proposed risk controls are appropriate or whether additional controls would be required.

With respect to *Table 5*, those rosters/rostering principles falling in Level 1 will require standard controls to mitigate the risk. Rosters falling in Level 2 will require additional controls to mitigate the additional risk associated with the extended hours of work. Those falling in Level 3 will require significant additional controls to mitigate the significantly increased risk.

The outer limits in *Table 4* and the aggregated outer limits in *Table 5* provide a 'safety net' to prevent excessive risk. Additionally, *Table 5* provides a guide for the timing and degree of additional controls that would be required to manage the risk of fatigue generated by an operator's work scheduling practices, procedures or individual schedules.

Work schedules that exceed the parameters for Level 1 controls are likely to lead to or contribute to fatigue. The further a work schedule diverges from the +0 working arrangements in any parameter, the more likely it is to present a fatigue risk and therefore increasing controls will be required to mitigate that risk.

**Figure 4. Definition of fatigue risk consequence categories for rail safety work**



**Table 4. Dimensions and risk factors as they contribute to a fatigue likelihood score<sup>70</sup>**

Dimension	Measure/risk factor	Unit	Likelihood score			Outer limit
			+0	+1	+2	
<b>Inter-shift breaks</b>	Total sleep opportunity <i>(sleep opportunity in 7-day period)</i>	No. of hours	More than 120	120-105	104-84	Less than 84
	Subsequent sleep opportunities <i>(total sleep opportunity in consecutive 2-day (48 hour) period)</i>	No. of hours	24	23	22	Less than 22
	Single sleep opportunity <i>(sleep opportunity in 1-day period)</i>	No. of hours	12	11	10	Less than 10
	Sleep opportunity is during the day <i>(between 0600-2200 hours)</i>	% of shifts	0	0-50	50-100	n/a
<b>Inter-sequence breaks</b>	Length of sequence	No. of shifts	1-5	6-7	8-12	More than 12
	Sequence includes night work <i>(between 2200-0600 hours)</i>	No. of shifts	0	1-3	4-7	More than 7

**Table 5. Likelihood scores and boundaries for each risk consequence category**

Consequence category	Level 1	Level 2	Level 3	Aggregate outer limit
<b>1</b> <i>(highest consequence)</i>	≤ 1	2	3	> 3
<b>2</b>	≤ 2	3	4	> 4
<b>3</b>	≤ 3	4	5	> 5
<b>4</b> <i>(lowest consequence)</i>	≤ 4	5	6	> 6

<sup>70</sup> The definitions of the specific factors considered are as for Option 3 and the detailed scientific rationale behind the table and proposed limits is included in *Appendix F: Fatigue Academic Working Group evidence base*.



**Table 6. Examples of minimum control requirements<sup>71</sup>**

		Risk Level 1	Risk Level 2	Risk Level 3
Fatigue-related training and education	Individual level	✓	✓	✓ Competency based
	Scheduling staff		✓	✓ Competency based
	Fatigue manager			✓ Competency based
Fatigue analysis and monitoring controls	Prospective schedule analysis	✓	✓	✓
	Retrospective schedule analysis	✓	✓	✓
	Aggregate prior sleep/wake reports		✓	✓
	Individual prior sleep/wake reports			✓
	Behavioural checklists reports			✓
	Prospective focus groups		✓	✓
	Retrospective focus groups			✓
Fatigue mitigation controls	Short rest break and or napping strategies.		✓	✓
	Alertness monitoring technologies		✓	✓
Incident management controls	Error management and analysis			✓
	Incident reporting	✓	✓	✓
	Incident analysis that focuses on fatigue as a contributory factor		✓ Incident types	✓ Individual incidents

### ***Legislative instrument***

In terms of the legislative instruments available under the framework of the National Law, Option 4 could be encompassed in the National Law (Act or Regulations) itself, an approved code of practice or guidance material. A discussion of each of these instruments and their impact of compliance is included in *Appendix B: Regulatory and non-regulatory tools*.

For the purposes of an impact analysis, it should be assumed that compliance is mandatory (as it is not feasible to estimate the extent to which operators may gain exemption to the requirements). As

<sup>71</sup> Note that these controls are examples only; operators should assess risk control measures as appropriate to the risk profile and the scope and nature of their operations.

such, it is assumed that the framework is included in a strong legislative instrument; in this case, this would be either the National Law itself or an approved code of practice.

## 9. Impact analysis

What follows is an analysis of the impacts of each of the regulatory options described in *Section 8. Options*.

In order to quantify the economic impact of the presented options, Frontier Economics was commissioned to undertake an assessment based on a social cost–benefit analysis. The paucity of data has precluded a quantification of the options based on the associated net present value of benefits; instead the analysis draws on available information and data to establish a relative ranking of the options. Frontier Economics' findings are referenced throughout this section, with the full details of the analysis and rankings presented in *Appendix G: Economic assessment – social cost-benefit analysis*.

The economic assessment is an essential component of the impact analysis and should be read in tandem with the following text, which explores those matters that are more qualitative and theoretical in nature.

### 9.1 Base case or counterfactual

As the base case, this situation is assumed to impose no regulatory impact and is the benchmark by which the options are assessed.

However, maintaining local variations for hours of work presents potential inefficiency for compliance and enforcement activities of the Regulator and for any cross-border operations, which will require operators to either comply with the most stringent requirements or maintain differing rostering rules and principles if operating in New South Wales and another state.

This option would not support the key objective of the reform, to support a national system of rail regulation; it carries with it the disbenefit of regulatory inconsistency.

### 9.2 Benefits of harmonisation

At present, approximately one third of the rail industry operates in more than one state or territory. The need to comply with varying state and territory rail safety laws increases the regulatory burden and operating costs to the rail industry, as well as the cost to policy makers and rail safety regulators. Managing these local variations adds to the compliance and administrative costs of rail transport operators, duplicating efforts or reworking proposals to suit the differing demands in each state or territory. This adversely impacts on the competitive position and efficiency of interstate rail operations in particular. This inefficiency also diverts resources from achieving best practice safety outcomes. These concerns have been the main driver behind the initiative to establish a National Law and resolve local variations.

As the Model Law allowed for local variations in the area of fatigue risk management, there are potential benefits to be gained from adoption of nationally consistent provisions. Any option other than maintaining local variations (that is, any option other than the base case) represents nationally consistent arrangements.

Regulatory consistency around fatigue risk management would provide certainty of the regulatory environment, allowing operators to focus on having a single safety management system, rather than either a core safety management system with additional materials for each state and territory of operation, or complying with the most onerous requirements across all operations. Thus, policy that lead to nationally consistent requirements for the safety management system could reduce compliance costs for multi-jurisdictional operators who may be able to streamline their information management and regulatory reporting systems. Additionally, it may encourage competitiveness and expansion of rail operations into adjacent jurisdictions if operators face fewer barriers (in this case, this would most likely apply to operators potentially extending services into New South Wales).

The benefits of harmonisation also extend to the Regulator, as it would benefit from only enforcing a single regulatory regime as opposed to two different regimes under the base case. The pooling of

specialised fatigue resources across different state and territory offices may serve to benefit the Regulator's efficiency in assessing hours of work and rest.

These benefits should be kept in mind when considering Options 1, 2, 3 and 4 as each offers potential benefits, addressing an area where overlapping and inconsistent regulation may be impeding economic activity. Notwithstanding this advice, it is important to recognise that regulatory harmonisation only represents a benefit in the situation that it is efficient; that is, the policy that is applied does not, in and of itself, create unnecessary costs (for example, through over-prescription).

A full exploration of the economic benefits of harmonisation is included in *Appendix G: Economic assessment – social cost-benefit analysis*.

## **9.3 Option 1 – No prescribed hours of work/rest are included in the National Law**

### **9.3.1 Economic assessment**

The economic analysis favours Option 1 as the preferred option, being superior to the counterfactual and all other options assessed. *Appendix G: Economic assessment – social cost-benefit analysis* contains the details of the assessment.

### **9.3.2 Safety impacts**

As discussed in *Section 5.2. Assumptions and constraints*, there are several limitations in the way in which the safety impacts of the options can be assessed, namely the lack of demonstrable evidence to suggest whether differences in the form of regulation (specifically, between less and more prescriptive approaches) have an impact on fatigue-related risks. This is particularly the case when the baseline is not the absence of all regulation, but rather encompasses an existing risk-based regulatory framework. As a result, the assessment is largely theoretical.

The removal of legislated hours of work and rest from New South Wales may result in changes to train drivers' hours. Such changes could include a gradual drift towards an increase in driver-only operations, shorter break times or potentially longer driving times, particularly as there is an existing shortage in drivers across the industry. The impacts of such changes, in practice, may include an increase in fatigue-related errors, incidents or accidents. The risks of these changes, however, are still required to be managed through the established risk management processes in the absence of prescribed restrictions on hours of work or rest, under the oversight of the Regulator. Additionally, through consultation, operators in New South Wales indicated that industrial agreements as they currently stand would preclude longer driving hours.

The potential advantage of this option is that operators in New South Wales can, under a risk management approach, adapt their own limitations to suit their operational requirements, potentially diverting attention away from compliance strategies towards risk management, and thereby possibly improving safety. Regulatory oversight would continue to be required, as it is for all other classes of rail safety workers in New South Wales and for all classes in other states and territories currently, to ensure that industry sufficiently manages train driver hours and does not allow duty times and safety to be adversely impacted by commercial pressures.

More generally, whilst the only direct impact of this option is the removal of New South Wales train driver hours of work and rest, there are some innate advantages and disadvantages of this regulatory option. Option 1 represents the least prescriptive and therefore the most performance-based option for the setting of hours of work and rest. This option best supports the co-regulatory framework of the National Law.

The benefit of performance-based regulation is its ability to emphasise the underlying objective of the regulatory requirement, in this case to specify 'safe hours of work and rest' for rail safety workers, and to require those regulated to address that objective directly. As previously discussed, rail transport operators are best-placed to understand their own specific operational environment and risks, particularly when considering the diversity of rail operations. The performance-based

aspect of this option means that responses are better directed, and limited resources are not diverted towards pure compliance activities but can be utilised to improve safety outcomes.

Moreover, co-regulation favours adaptability and responsiveness. It provides flexibility that supports operators in aligning their risk management with the scope and nature of their operations and risk profile, promoting efficiency, and encouraging localised innovation in safety management. This benefits both the Regulator and the regulated; both are provided the option of adjusting requirements and improving practices in light of new information and advancements.

It is theoretically possible to develop rail safety law on the basis of a single, overarching requirement for operators to manage risks to safety. However, in practice, capabilities and standards of risk management vary between rail transport operators. While many operators manage risks to a rigorous standard, some have access to a lesser degree of relevant skills, knowledge and resources. This is particularly the case in the area of fatigue risk management, where regulators have reported a high degree of variability between operators. For this reason, overseeing and assisting rail transport operators is an important role of the Regulator in ensuring safety.

Such assistance and oversight is an integral part of co-regulation. The co-regulatory approach is most effective when there is a strong degree of capability and willingness amongst industry members to comply. This is predominantly, but not uniformly the case with rail safety regulation and fatigue risk management.

Elements of subjectivity in more general provisions (for example, the general safety duties), sometimes in combination with a lack of risk management capability on the part of a rail transport operator, have led to confusion and disagreement with regulators over what constitutes compliant risk management. In some circumstances, rail safety regulators have reported that the process of negotiating with rail transport operators on how to achieve compliance has proven to be protracted, inefficient and even unfruitful. Thus, a disadvantage of this purely performance-based option is that there is a greater potential for operators to exploit such a measure as *de facto* deregulation, either knowingly, being recalcitrant operators, or unwittingly, due to a lack of understanding of the risk being managed. A primary limitation of a performance-based approach is that operators may not be inclined to prioritise safety over other competing goals and good fatigue risk management may be sacrificed in favour of increased flexibility or efficiency. This risk, however, should be mitigated under the National Law by strong oversight provisions imparted to the Regulator.

In practice, some regulators have stated that this leads to the risk of compromise on how standards of safety management are upheld. As a result of limitations in operator resources and expertise, the hours of work developed by operators may not have an appropriate scientific basis or meet industry best practice, potentially having impacts on safety in the absence of regulator intervention. Again, it should be noted, that a skilled Regulator with relatively close relationships with regulated parties (as is the case in the case of the Australian rail industry), should effectively manage this risk through intervention.

Where the maturity of certain operators or segments of the industry may be insufficient to produce a safety outcome, it should be noted that other tools such as guidelines, standards or codes of practice could be employed to assist operators without specialist expertise in the management of fatigue under this option.

### **9.3.3 Regulator impacts**

There is unlikely to be a significant impact on the Regulator under Option 1.

Removal of the legislated 'safety net' from New South Wales may require a minor increase in regulatory resources to audit and review driver hours under a full risk management approach. This impact would not be significant, as, despite the legislated restriction, an operator's risk assessments currently need to be reviewed for not only drivers, but for all rail safety workers.

In contrast, there may be a minor saving in not being required to assess exemption applications for rail transport operators seeking to operate outside the prescribed restrictions.

There are potential benefits for the Regulator in that it has some greater flexibility without limits stated in legislation. It could be envisaged that a situation may arise where, with prescribed

limitations, the Regulator, may wish to restrict hours of work, more so than what is legislated, in response to an operator's particular risk profile and safety concerns. It may be potentially more difficult to do this with legislated hours in place, as it is foreseeable that the Regulator may need to provide a greater level of explanation and evidence to the regulated, as there may be the perception that the legislated limits are seen as 'safe' under all operating environments. Without limitations stated, this may provide the Regulator with greater scope to enforce different, or more restrictive, hours of work and rest as it may deem appropriate. Given that the Regulator has the ability under the National Law to enforce standards as it considers appropriate, the Regulator itself could be viewed as an effective 'safety net', without the need for legislated limits.

Looking more generally at this option as a purely co-regulatory approach to manage the risks of working hour restrictions, it should be noted that this option carries with it some innate disadvantages for the Regulator. A weakness of the co-regulatory approach is also the limited authority of the Regulator to enforce undefined standards of safety management; while, under the National Law, the Regulator can act if not satisfied with an operator's approach, in practice there have been indications that this has proven difficult for some regulators (this aspect may be resolved by the establishment of the National Regulator itself).

As mentioned previously, while the assistance and support of the Regulator is a feature of co-regulation, in some circumstances, rail safety regulators have reported that the process of negotiating with rail transport operators has proven to be inefficient and sometimes ineffective. Additionally, with finite resources, there is the risk that the Regulator may be unable to identify and address all cases of non-compliance or provide the level of support required by operators to manage more complex risks, such as fatigue. This aspect may be overcome by the development of other tools, such as standards and guidance material; under the National Law, the Regulator has the scope to utilise such tools to assist enforcement.

However, going further, where an operator disagrees on certain types of decisions by the Regulator (which include those relating to safety management systems), they may apply for a review and subsequently appeal to a court. Although in practice this has proven unusual, in such circumstances the court would determine the standard to which the operator's safety management system would be held. It is conceivable that the court may arrive at a different conclusion to that of the Regulator. The problem lies not so much in the risk of a court contradicting the judgement of the Regulator, as it does in the protracted and resource-intensive process of resolving the dispute.

Additionally, allowing operators to set hours of work solely via the risk management approach requires the Regulator to review a diverse range of operator approaches, requiring vigilance, expertise and resources on the part of the Regulator to evaluate and assess each operator's proposal.

The overall impact of these factors on the Regulator overall is considered to be minimal in relation to hours of work and rest, as this represents a relatively small aspect of the overall safety management system.

### **9.3.4 Rolling stock operator impacts**

The removal of the legislated hours of work and rest from New South Wales may result in changes to train driver hours. Such changes could include an increase in driver-only operations, shorter break times and potentially longer driving times.

Through consultation, some rail transport operators have expressed that the New South Wales approach may be overly restrictive, perhaps limiting hours of work without providing a corresponding safety benefit; the evidence for this is lacking, however, if this is the case, the above-mentioned changes to driving hours and conditions could provide efficiency benefits to operators. While an exemption provision existed under the New South Wales schedule, given that the operator could demonstrate an equivalent level of safety, it is conceivable that the cost of the process or difficulty in gaining the exemption may have served as a deterrent to doing so.

Despite this, it is unlikely that hours of work or rest are likely to change significantly under this option, as operators in New South Wales have provided feedback that industrial instruments are equivalent to, or more constraining than, the prescribed hours.

Feedback through consultation indicated that New South Wales operators may be subject to marginally lower administrative costs in not having to demonstrate compliance with the prescribed hours of work in New South Wales.

Looking at Option 1 more generally again, there are both advantages and disadvantages to this least prescriptive option.

The benefit of performance-based regulation is its ability to emphasise the underlying objective of the regulatory requirement, in this case to specify 'safe hours of work and rest' for rail safety workers, and to require those regulated to address that objective directly. This means that responses can be better tailored to individual circumstances and operational requirements, improving operator efficiency. This may be particularly important over the longer term as, in the absence of any prescription around working hours, future innovations for risk management can be introduced by operators more promptly than by amending legislative instruments.

An associated concern, however, is that "there is considerable scope for abuse in a system that lets those who have most to gain from extending work hours decide what those work hours will be."<sup>72</sup>

Further to this, performance-based regulation may result in uncertainty amongst rail transport operators regarding acceptable means of compliance and determining what hours of work and rest may be acceptable to the Regulator. The disadvantage is this may require additional expertise and resources from operators to develop appropriate hours in the absence of any precedents. The outcome could be a varied and inconsistent approach to managing hours of work and rest in the rail industry. This issue could be alleviated by the development of guidance material or standards to assist rail transport operators to comply with their duties and ensure a level of uniformity under the oversight of the Regulator.

### **9.3.5 Rail infrastructure manager impacts**

There would be no impact to rail infrastructure managers under this proposal, as all states and territories allow operators to determine hours of work for rail safety workers other than drivers via a risk-based approach under the fatigue risk management program.

### **9.3.6 Rail safety worker impacts**

The removal of the 'safety net' from New South Wales may result in changes to train driver hours of work over the course of time, as mentioned previously. This may be detrimental for those rail safety workers if rostering arrangements stretch beyond that which may be considered acceptable, although this is unlikely to be the case due to the requirements on operators under the general duties and fatigue risk management program requirements, and the fact that operators have advised that industrial agreements would limit the extension of hours beyond what is currently legislated. Train drivers who have certainty under the New South Wales schedule as to maximum duty times may be subject to more shift variability over the longer term. In contrast, some train drivers would potentially enjoy some benefits under this option, being afforded greater flexibility in their working arrangements to account for social or family needs.

A purely co-regulatory approach towards working hours provides less consistency and certainty for rail safety workers, who, under this approach, may face differing rostering criteria between employers.

### **9.3.7 Summary**

The advantage of Option 1 primarily lies in the benefits of harmonisation and co-regulation, which promotes efficiency, productivity and innovation, and supports regulated parties to tailor their

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<sup>72</sup> Jones CB, Dorrian J Rajaratnam SMW and Dawson D (2005). *Working hours regulations and fatigue in transportation: A comparative analysis*. Safety Science, 43: 225-252.



fatigue risk management program to their specific circumstances. There may be minor administrative benefits associated with the removal of prescription in New South Wales, although it is unlikely that this is a significant impact.

It is recognised that a potential disadvantage of this approach is that there is a greater risk of operators to exploiting such a measure as *de facto* deregulation; relative to the base case, this is only pertinent to train driver hours for operations in New South Wales. There is insufficient evidence to indicate that this is the case, however, as, firstly, it is reported that industrial agreements (as they stand currently) would limit this effect and, secondly, it is considered that the National Law requirements are sufficiently robust to prevent this occurring (particularly with respect to the reporting requirements and the comprehensive provisions for regulatory oversight).

## **9.4 Option 2 – New South Wales arrangements are included in the National Law (applied nationally)**

### **9.4.1 Economic assessment**

The economic analysis has assessed Option 2 as being superior to Option 3, but relatively more costly than the baseline and Options 1 and 4. *Appendix G: Economic assessment – social cost-benefit analysis* contains the details of the assessment.

### **9.4.2 Safety impacts**

Application of the New South Wales restrictions on train driver hours nationally could act as a 'safety net' to 'catch' extreme rostering situations, allowing risk management processes to occur within legislated boundaries. This situation may be beneficial where a rail operator's safety culture maturity is low and the operator's commitment to safety is questionable, or where a well-meaning operator's approach to fatigue risk management fails to prevent undesirable hours of work. Some regulators have indicated that it may provide a level of comfort when dealing with less sophisticated operators.

Legislating hours of work and rest also creates an enduring barrier against future 'practical drift' towards harsher duty hours, in response to commercial or other pressures and thus may safeguard against excessive fatigue. This regulatory approach may also have the benefit of reducing, or at least being perceived to place limits on, the potential for regulatory capture, by acting as reassurance to parties that regardless of any imbalance in negotiating positions or resources that might arise in future, there are certain boundaries that organisational approaches cannot exceed.<sup>73</sup>

However, the proposed framework may not accord with industry best practice or support continuous improvement. This is because operators may not be driven to develop better approaches, focussing on compliance rather than innovation. In addition, amending legislation can be time consuming, and technological advancements, such as vigilance control systems and automatic train protection, and other factors may make the schedule obsolete over time or more restrictive than necessary (in turn precipitating a high number of exemptions or requiring 'class exemptions to the schedule via a regulation-making process). Furthermore the prescribed hours, while they may be appropriate in the New South Wales operating environment, may be overly limiting when considering the broad range of operations and diversity across the industry, particularly long haul or remote operations where there may not be the same level of risk (for example, less congestion, closed networks).

There is a risk that prescribed hours may shift focus away from the management of fatigue, under the assumption that compliance with the prescribed limitations is sufficient.<sup>74</sup> Their usage may also

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<sup>73</sup> Regulatory capture refers to a distortion or softening of a regulator's influence attributable to an undesirably close relationship with the regulated party.

<sup>74</sup> Stewart S, Holmes A, Jackons P and Abboud R (2006). *An integrated system for managing fatigue risk within a low cost carrier*. Proceedings of the 59<sup>th</sup> Annual

shift from guidance to reduce excessive fatigue towards a rostering target and acceptable practice, thereby inadvertently increasing fatigue.<sup>75</sup>

A major risk is that operators may view the prescribed hours as intrinsically 'safe', without due regard to the risk environment, as they are sanctioned by government.

It is questionable as to whether hours prescribed in legislation are, in fact, beneficial to the Regulator. For example, if the Regulator wishes to restrict hours of work, more so than what is legislated, in response to an operator's particular risk profile and safety concerns, it may be potentially more difficult to do this with legislated hours in place; in this event, it is foreseeable that the Regulator may need to provide a greater level of explanation and evidence to the regulated, as there may be the perception that the legislated limits are seen as 'safe' under all operating environments.

Given that the Regulator has the ability under the National Law to enforce standards as it considers appropriate, the Regulator itself could be viewed as an effective 'safety net', without the need for legislated limits. By empowering the Regulator in respect of working with operators to develop the detail in their safety management systems, the risk-based approach of the fatigue risk management program allows for such specific detail to be required of particular operations where the risk profile suggests this is appropriate. As such, prescribed hours may be viewed as superfluous based on the existing regulatory framework.

Further to this, the limitations set out in Schedule 2 to the *Rail Safety Act 2008* (NSW) may not be considered a comprehensive or state-of-the-art framework, as there are significant factors that are not taken into consideration. In particular, a brief review of the New South Wales prescribed conditions by an independent fatigue expert indicated the following issues of concern:<sup>76</sup>

- The maximum shift lengths are only modulated by crew composition, and not by the time of day that the shift occurs. A 12-hour driving shift during daytime hours will not have the same impact on fatigue as a 12-hour driving shift during the night. These limits should be modulated according to the duty start time.
- The minimum break of seven hours between each shift taken away from the home depot is quite short and will not provide enough time for sleep when other activities are taken into account (for example, meals and shower). Furthermore, there is no modulation of the rest time according to the time of day or night. Seven hours of break taken during daytime hours are likely to allow a very small amount of sleep because of the circadian rhythm of sleep propensity.

This illustrates a disadvantage of prescriptive duty limits in that they may not be well-constructed, and may fail to take into account all relevant fatigue-inducing factors. In a combined approach, however, the resulting risk should still be addressed by other elements of the operator's fatigue risk management program.

While the above relates only to train drivers, other rail safety workers' hours of work and rest are determined via the risk management approach. In these circumstances, the more general advantages and disadvantages of the co-regulatory approach are applicable (as described under Option 1), although these are captured in the baseline.

### 9.4.3 Regulator impacts

Application of the New South Wales schedule nationally may ease the regulatory task in monitoring and evaluating operators' proposed train driver hours. The regulator would need only to enforce a

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International Air Safety Seminar (IASS), Paris, France, available at <http://www.faiSAFE.com/news/easyJet-paper.pdf>.

<sup>75</sup> Ibid.

<sup>76</sup> Extract from a discussion paper prepared by the National Transport Commission and Dédale Asia Pacific, released July 2010. Advice provided by Dr Philippe Cabon, a world-recognised fatigue expert, 26 July 2010.

single set of prescribed hours, rather than having the resources and expertise to know, and then evaluate, different sets of hours for each operator. However, considering that the Regulator's task may only be eased with respect to train driver hours only, this impact is considered to be minor. In any event, the Regulator would still be required to review and assess the risk management approach, even in the presence of prescribed hours.

It is also questionable as to whether hours prescribed in legislation are, in fact, beneficial to the Regulator. For example, if the Regulator wishes to restrict hours of work, more so than the legislated hours of work, in response to an operator's particular risk profile and safety concerns, it may be potentially more difficult to do this with legislated hours in place; in this event, it is foreseeable that the Regulator may need to provide a greater level of explanation and evidence to the regulated, as there may be the perception that the legislated limits are seen as 'safe' under all operating environments

Additionally, the prescribed hours may be viewed as superfluous. Given that the Regulator has the ability under the National Law to enforce standards as it considers appropriate, the Regulator itself could be viewed as an effective 'safety net', without the need for legislated limits. By empowering the Regulator in respect of working with operators to develop the detail in their safety management systems, the risk-based approach of the fatigue risk management program allows for such specific detail to be required of particular operations where the risk profile suggests this is appropriate.

The primary cost area of this proposal for the Regulator is in the need to assess exemption applications in the event that the prescribed hours may be too restrictive for some operators. While the Regulator already has a role in accrediting operators and periodically auditing an operators' fatigue risk management program, assessing exemptions would add to its role. Under the co-regulatory principles of the National Law, it is anticipated that the burden of such assessments would be shared between the Regulator and operators, including:

- operators to conduct risk analyses to support applications for exemptions
- the Regulator to assess such applications, including associated and complementary tasks, such as undertaking research.

Under existing arrangements, primary responsibility for developing a compliant safety management system lies with rail transport operators. The adoption of an additional exemption provision, including the need for the Regulator to approve alternative arrangements, would represent a transfer of some responsibility from the operator to the Regulator.

However, under the co-regulatory framework of the rail safety law, regulators currently invest significant resources in assisting operators with complying, particularly smaller operators. This means that there is no clear dividing line between compliance costs of the Regulator and those of rail transport operators.

State and territory regulators were mixed in their assessments of how the exemption provision would impact on resources of the Regulator. Some feedback indicated that the process of assessing alternative arrangements may require resources comparable or exceeding those necessary to oversee compliance with schedule, with others indicating minimal cost imposition as the requirement to review risk management practices would be applicable in either case.

As previously mentioned, there is a risk that operators may view the prescribed hours as targets or acceptable practice; similarly, there is a similar risk that regulatory staff may view compliance with the prescribed hours in a 'checklist' approach to judge compliance with the general duty.

Over the past six years of such restrictions being in place in New South Wales only three exemption applications have been submitted. It is foreseeable that, under a national scheme with differing operating environments, the number of applications would increase, particularly initially. Whilst ongoing compliance and enforcement work would most likely be unchanged under this option after granting an exemption, there may be a possible cost in variations of exemptions.

Over time, with technological advancements, the schedule may also become overly restrictive, precipitating a higher number of exemptions, which may impose a burden on the Regulator.

Again, the above relates only to train drivers, other rail safety workers hours of work and rest are determined via the risk management approach. In these circumstances, the more general

advantages and disadvantages of the co-regulatory approach are applicable (as described under Option 1) and captured in the baseline.

#### **9.4.4 Rolling stock operator impacts**

The New South Wales driver restrictions could be used by industry to guide and limit rostering practices, providing unambiguous limitations that are easy for operators and workers to understand. This approach may benefit smaller or under-resourced operators who do not have the internal expertise or funding to explore more flexible options. However, the proposed hours may not support continuous improvement, because operators will not be driven to develop better approaches, limiting future efficiency benefits, and may be seen as rostering targets or acceptable practice as opposed to outer limits, compromising safety.

The major risk of such restrictions is that they may be excessively limiting, impacting significantly on organisational efficiency and productivity. Operators, particularly in the mining sector and more remote areas, have indicated that the restrictions on driver-only operations may impact significantly, requiring additional driver resources in order to comply. Even some of the more seemingly innocuous limitations, such as the requirement for a 30-minute break in some circumstances, have raised significant concern with operators and may require the employment of additional drivers for some operators.

Additionally, operators have indicated that there may be increased administrative compliance costs, reflecting increased data and information gathering costs and costs related to developing the necessary information management and rostering systems in order to demonstrate compliance with the prescribed hours to the Regulator.

Operators, that may be facing significant impacts (that is, constrained hours of work without the resultant safety benefit), may be eligible to apply for an exemption from the prescribed requirements as per regulation 14 of the *Rail Safety (General) Regulations 2008* (New South Wales). This process requires the operator to satisfy the Regulator via a risk-based process that sufficient controls have been implemented which effectively replace those in Schedule 2. As described above, it is anticipated that the burden of such assessments would be shared between the Regulator and operators, with operators required to provide evidence (and scientific justification) to support the alternative provisions proposed in lieu of one or more of the limits. This places the onus on the operator to demonstrate safety, and the Regulator assesses the risk management approach. While this is not different from normal risk management processes, it is probable that the 'hurdle' is higher when gaining an exemption and some operators may require additional resources or expertise in the form of consultancy in order to put forward a robust application.

#### **9.4.5 Rail infrastructure manager impacts**

There would be no impact to rail infrastructure managers under this proposal as all states and territories allow employers to determine hours of work for rail safety workers, other than drivers, via a risk-based approach under the fatigue risk management program.

#### **9.4.6 Rail safety worker impacts**

The application of the New South Wales 'safety net' will impact train drivers nationally, restricting hours of work for many drivers. Benefits may be realised where duty times are limited, resulting in shorter shifts with longer breaks. Rail safety workers who drive trains will also have greater certainty about their duty time limitations.

However, this option removes flexibility for train drivers, potentially being limited in their hours of work without a corresponding safety benefit. Rail safety workers often value flexibility for reasons other than safety, to account for social or family commitments.

For all other rail safety workers whose hours of work and rest would still be determined under the risk management approach, there are advantages of flexibility and disadvantages relating to a lack of certainty, which are applicable under this option but also captured under the baseline.

### 9.4.7 Summary

There may be benefits of Option 2 as they relate to the provision of a 'safety net' around hours of work and rest for rail safety workers who drive trains. However, there are a number of associated concerns in that prescribed limits are not overly consistent with a co-regulatory environment, may shift focus away from good risk management practices, may be viewed as targets, acceptable practice or as inherently safe, without due regard to the risk environment.

Additionally, the prescribed hours may be viewed as superfluous, as the National Law already contains provisions that empower the Regulator to enforce standards as it considers appropriate and the risk-based approach of the fatigue risk management program allows for such specific detail to be required of particular operations where the risk profile suggests this is appropriate.

While this option is assessed as relatively costly based on the feedback from operators in other states, this is not to say that the prescribed hours of work and rest for train drivers are not appropriate for the operating environment in New South Wales, where there is perhaps a greater level of risk (due to the interaction of freight and passenger trains, congestion, etc.) than in other operating environments. In other states and territories, where the risks may be lower, the hours of work may limit productivity without the offsetting safety benefit, creating inefficiency.

Based on the feedback that the prescribed limitations may not be appropriate for lower risk operating environments or similarly in the event of advancing technology, the exemption provision may be increasingly utilised. The necessity for the Regulator to approve alternative arrangements may represent a transfer of some responsibility from the operator to the Regulator; this appears inconsistent with the co-regulatory nature of rail safety regulation.

## 9.5 Option 3 – Simplified risk-based approach to limiting hours of work and rest

### 9.5.1 Economic assessment

The economic analysis has assessed Option 3 as being the most costly option under consideration relative to the baseline. *Appendix G: Economic assessment – social cost-benefit analysis* contains the details of the assessment.

### 9.5.2 Safety impacts

Option 3 represents a regulatory option that operationalises advice provided by the Expert Panel and subsequently by the Fatigue Academic Working Group, albeit with modifications to simplify the regulatory framework.

Compared to other options considered, the duty time limitations proposed under this option are based on the most wide-ranging suite of fatigue issues and considerations, taking into account a number of the fatigue-related factors introduced in *Section 2.6.4. Operational elements of fatigue management* and as outlined in *Appendix F: Fatigue Academic Working Group evidence base*. The limitations cover intra-shift, inter-shift and inter-sequence breaks and the framework is intended to guide operators on the need to put additional controls in place to mitigate the risk of extended hours of work or restricted periods of rest.

The major benefit of this approach is that it incorporates two distinct but complementary barriers against fatigue-related risks: the fatigue risk management program and comprehensive work/rest limitations. This option represents a hybrid approach in which the risk management methods are supplemented with boundaries. While this is also the case with Option 2, the applicability of this framework to a broader range of rail safety workers is possible (discussed later). The approach accords with the principle of defences-in-depth, whereby multiple barriers or precautions (ideally of different forms) are created so that, in order for an unwanted event to occur, all barriers must



simultaneously fail.<sup>77</sup> In the present context, adopting a combined approach may afford a greater level of protection than either one in isolation.

As with Option 2, the provision of a 'safety net' may prove beneficial where a rail operator's safety culture maturity is low, where the operator's commitment to safety is questionable, or where a well-meaning operator's approach to fatigue risk management fails to prevent undesirable hours of work. Such an approach also creates an enduring barrier against future 'practical drift' towards harsher duty hours, in response to commercial or other pressures and thus may safeguard against excessive fatigue. Again, this approach may have the benefit of reducing, or being perceived to place limits on, regulatory capture.

To the extent that this option provides a more comprehensive management of fatigue-related risk through hours of work and rest for the broadest range of workers, it could realise safety benefits in so far as reducing fatigue-related errors and ensuring adequate controls are in place. However, the logic of this is tenuous as it hinges on the assumption that the risk-based approach is deficient and currently producing poor safety outcomes, the evidence for which is lacking. The outcome of this option should, if operators are complying with their duties under the law, not be different to that which should be achieved through the risk-based approach of the fatigue risk management program, under the oversight of the Regulator.

A significant issue raised by operators, is that, in order to comply with the outer limits expressed in this option, the overall risk that rail safety workers are exposed to may inadvertently increase. As described in *Section 4.3. Industry approach to managing hours of work and rest*, operators approach fatigue risk management in a holistic sense, integrated with other risks (particularly human factors risks) in the safety management system, such as drug and alcohol and health and fitness management programs. This allows operators to balance fatigue risks with other risks that rail safety workers are exposed to. For example, track maintenance workers are more likely to be rostered for night work to avoid exposure to active train operations, daytime heat stress or fire risks from welding during the day; in this way, the risks due to fatigue are balanced against environmental risks and it is this overall risk that the operator is conscious of managing. Prescriptive approaches, which limit hours of work, may shift an excessive focus on one risk at the expense of others; for example, to comply with the limitations on night work, operators may be required to perform track maintenance work during daytime hours, exposing workers to other risks that may outweigh the fatigue-related risk.

Further disadvantages are again that the framework may not accord with industry best practice and the specific hours may date in light of technological advancements or emerging science. There is again a risk that defined hours may shift focus away from the management of fatigue towards compliance and that the limits may be used as a rostering target or acceptable practice, thereby inadvertently increasing fatigue.

As opposed to Option 4, the framework under Option 3 does not provide an appreciation of the nature and consequence of the task being performed by the rail safety worker. Additionally, it could allow all dimensions to be extended to the outer limit (that is, neglecting the interaction between the fatigue-inducing dimensions). These factors could permit unsafe hours of work. While the risk management process should prevent this from occurring, the potential for stated limits to become targets and acceptable practice may lead to unsafe outcomes.

As described in *Section 4.3. Industry approach to managing hours of work and rest*, in practice, many rail transport operators have a reliance on prescriptive rules provided by industrial agreements and bio-mathematical models. As observed, this perhaps indicates that further education is required for industry with respect to risk management in this area of human factors. Some regulators perceived Option 3 as simply providing another prescriptive rule set that some operators would come to rely upon, shifting the focus away from risk management.

A further risk is that operators may view the prescribed hours as intrinsically 'safe', without due regard to the risk environment, as they are sanctioned by government.

This option differs from the more simple, one-dimensional 'safety net' presented in Option 2. Rather than the limits creating a potential weakness by not incentivising innovation, this model is intended

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<sup>77</sup> Hollnagel E (2004). *Barriers and Accident Prevention*. Ashgate, Aldershot.

to reward more innovative approaches, providing increased flexibility to those operators that can demonstrate substantial risk control measures. In this way, this option may be seen to support continuous improvement in relation to the management of hours of work and rest. However, to the extent that the outer limit cannot be rostered beyond, the model may stifle innovation.<sup>78</sup>

Despite the intention to encourage innovation, a number of stakeholders have provided feedback indicating that the opposite outcome is more likely, and that the outer limits will be used as rostering targets and as compliance 'checklists' for regulatory staff diverting attention away from thorough risk management.

### 9.5.3 Regulator impacts

Benefits to the Regulator are primarily in improving the efficiency of evaluating and monitoring hours of work and rest. Prescribed limits would offer greater direction for the Regulator to assess, determine appropriate levels of controls and hence ensure compliance. The Regulator would need only to enforce a single model of prescribed hours, rather than having the resources and expertise to know, and then evaluate, different sets of hours for each operator. However, this is considered to be of minor value as the Regulator would still be required to review and assess the risk management approach, even in the presence of prescribed hours.

In so far as prescribed limits provide more certainty to both operators and the Regulator is assessing compliance, it is feasible that there would be less need for interaction between the Regulator and regulated during assessment of the hours of work component of the fatigue risk management program, reducing costs to both parties and reducing iterative loops.

In addition, it is likely that the regulatory task associated with enforcement activities would be eased for the Regulator, with clear precedents on which to judge compliance, reducing the effort associated with serving improvement notices in cases on non-compliance and providing for prosecution attempts to be more successful.

However, there are disbenefits in that if the framework were to be prescribed in the National Law, there may be the requirement to assess exemptions; or, if included in an approved code of practice, the Regulator may be required to assess alternative compliance means. As described in detail under Option 2, this may represent a cost imposition on the Regulator and the requirement to issue 'approvals' may represent a transfer of some responsibility from the operator to the Regulator, inconsistent with the co-regulatory environment.

Additionally, as operators have indicated that an excessive focus on fatigue risk management may divert attention from overall safety management, regulatory effort may also be disproportionately allocated to undertaking compliance activities rather than focussing on overall safety management and the areas of greatest risk, such as oversight of emergency management and relief practices.

It is again questionable as to whether hours prescribed in legislation are, in fact, beneficial to the Regulator. For example, if the Regulator wishes to restrict hours of work, more so than what is legislated, in response to an operator's particular risk profile and safety concerns, it may be potentially more difficult to do this with legislated hours in place; in this event, it is foreseeable that the Regulator may need to provide a greater level of explanation and evidence to the regulated, as there may be the perception that the legislated limits are seen as 'safe' under all operating environments.

Given that the Regulator has the ability under the National Law to enforce standards as it considers appropriate, the Regulator itself could be viewed as an effective 'safety net', without the need for

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<sup>78</sup> This is true of legislated limits (those contained in the National Law). Limits contained in an approved code of practice are less likely to have this effect, as a code allows for alternative compliance means; the effect of this, in so far as it represents a 'reversal of the onus' in that the operator is required to demonstrate the effectiveness of the alternative processes, may serve as a deterrent, however, for many operators. As such, a code of practice may be viewed as binding and have a similar effect.



legislated limits. By empowering the Regulator in respect of working with operators to develop the detail in their safety management systems, the risk-based approach of the fatigue risk management program allows for such specific detail to be required of particular operations where the risk profile suggests this is appropriate. As such, prescribed hours may be viewed as superfluous based on the existing regulatory framework.

Consultation revealed that operators may have difficulty interpreting the requirements under this option, given the relative complexity of the proposed model, and it is feasible that the Regulator may need to allocate additional resources to education and assistance for rail transport operators.

#### **9.5.4 Rail transport operator (rolling stock operator and rail infrastructure manager) impacts**

The major advantage for rail transport operators of defined hours of work and rest, including guidance on acceptable risk control measures, is the certainty of acceptable means of compliance. This may potentially minimise the number of iterative loops with the Regulator required to achieve compliance and provide benefits to operators with limited resources, lack internal expertise or with low safety maturity.

This option proposes a significant change for all rail transport operators, with a greater range of rail safety workers covered than in any other regulatory approach in force. Operators have indicated that there are potentially significant cost impositions for the analysis of rosters, redesigning of rostering systems to account for the restrictions and imported costs of documentation to demonstrate compliance to the Regulator. These administrative compliance costs, have contributed to the economic assessment of this option.

This level of prescription may be unnecessary where operator safety culture maturity is high and operators are already committed to safety, adding to regulatory burden in administrative compliance costs without a resultant safety benefit.

Additionally, the proposed hours may not support continuous improvement, because operators will not be driven to develop better approaches, limiting future efficiency benefits, and may be seen as rostering targets as opposed to outer limits, compromising safety.

As a complicating factor, there is a great diversity in operations and operating environments across the country. The framework under Option 3 does not provide an appreciation of the nature and consequence of the task at hand and may either be too lenient (whereby the risk management approach should compensate) or potentially too restrictive (imposing costs).

The major impact of such restrictions is that they may be excessively limiting, impacting significantly on organisational efficiency and productivity. The economic assessment of this option reflects these concerns. Operators, particularly in the mining sector and freight transport areas, have indicated that the restrictions may impact significantly, requiring additional resources in order to meet existing levels of service.

The concept of intra-shift breaks has raised significant concern with operators. With the exception of drivers on some suburban passenger services, operators advised that it is impractical to accurately report on any definition that does not accord with industrially defined breaks (for example, meal breaks). As the broader definition of 'time-off-task' cannot be utilised, the dimension is more limiting and this has contributed to the unfavourable economic assessment of this option. Some operators have indicated that the limitations on intra-shift breaks may be too constrictive in so far as the provision of a rest break has 'knock-on' effects on high capacity and constrained corridors; the flow-on effects and potential queuing as a result, imparts a high cost.

Operators, that may be facing significant impacts (that is, constrained hours of work without the resultant safety benefit), may be eligible to apply for an exemption from the prescribed requirements if the limits are prescribed in law. If the limits are contained in an approved code of practice, the operator would be required to demonstrate alternative compliance means; the effect of this is a reversal of the onus. In either situation, the operator would be required to satisfy the Regulator via a risk-based process that sufficient controls have been implemented which effectively manage the risk. As described above, it is anticipated that the burden of such assessments would be shared between the Regulator and operators, with operators required to provide evidence (and

scientific justification) to support the alternative provisions proposed in lieu of one or more of the limits. This places the onus on the operator to demonstrate safety, and the Regulator assesses the risk management approach. While this is not different from normal risk management processes, it is probable that the 'hurdle' is higher when gaining an exemption or proving alternative compliance means, and some operators may require additional resources or expertise in the form of consultancy in order to put forward a robust application.

### 9.5.5 Rail safety worker impacts

The definition of rail safety work is broad, encompassing driving or despatching rolling stock, signalling, coupling/uncoupling rolling stock, maintaining or testing rolling stock or rail infrastructure, performing electrical work, certifying rolling stock and a variety of other tasks (refer section 8 of the National Law).

The New South Wales regulations considered in Option 2 apply only to rail safety workers who drive trains. However, it may be logical and beneficial to consider covering other worker groups under prescribed hours of work and rest. As noted in *Appendix E: Fatigue risk management practices in rail internationally*, other countries apply hours of work restrictions more broadly than occurs in New South Wales.

This option covers all rail safety workers, and there is logic in the proposition that rail safety workers other than train drivers should be covered by defined duty time limits. As Jones et al note, "in a working environment where many people control the safety of a train, it is hard to see why some employees are afforded safety protection by the law, but not others".<sup>79</sup> Any employees involved in rail safety work can be affected by fatigue, although the potential consequences – from personal injury to a major accident – will vary according to the work being performed. There is some evidence (as outlined in the following paragraphs) that fatigue in rail safety workers other than train drivers may have been a contributing factor in Australian rail accidents and incidents.

For example, on 31 January 2003, a high-speed derailment in Waterfall (New South Wales) resulted in seven fatalities and multiple injuries. The subsequent investigation found that fatigue may have affected both the driver and the guard. Recommendations included that the rail regulator and operator develop a guideline for management of fatigue across New South Wales, including a risk-based determination of the upper acceptable fatigue limit for rail safety workers.

Additionally, on 16 July 2007, a signal electrician and his assistant were fatally injured near Singleton (New South Wales) while performing rail safety work. The Office of Transport Safety Investigations report stated that "it is...probable that both workers were suffering from a degree of fatigue and that this may also have affected their appreciation of the risks associated with their task."<sup>80</sup> The Coroner's Report identified a number of issues, one of which was related to fatigue management and recommended that duty time limitations be introduced.<sup>81</sup>

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<sup>79</sup> Jones CB, Dorrian J Rajaratnam SMW and Dawson D (2005). *Working hours regulations and fatigue in transportation: A comparative analysis*. Safety Science, 43: 225-252.

<sup>80</sup> Office of Transport Safety Investigations (2007). *Rail Safety Investigation Report: Fatal Injuring of Two Rail Maintenance Workers, Singleton NSW, 16 July 2007*. Office of Transport Safety Investigations, Sydney, available at <http://www.otsi.nsw.gov.au/rail/Investigation-Report-Singleton-final.pdf>.

<sup>81</sup> Independent Transport Safety Regulator (2009). *Coroner's Court, Singleton. Inquest touching the deaths of Geoffrey John Johnson and John Patrick Turner*. Independent Transport Safety Regulator, Sydney, available at [http://www.transportregulator.nsw.gov.au/rail/publications/reports/singleton-inquest\\_2009.pdf/view](http://www.transportregulator.nsw.gov.au/rail/publications/reports/singleton-inquest_2009.pdf/view).

On 7 December 2007, two Queensland Rail track workers were fatally injured as a consequence of being struck by a rail vehicle at Mindi, Queensland. Again, fatigue was implicated in the investigation report as a contributing factor.<sup>82</sup>

As such, with increased coverage, to the extent that rail transport operators are required to provide stronger evidence of sufficient controls in order to access longer working hours, there may be benefits realised by a broad range of rail safety workers. However, as previously discussed, the extent to which this may be the case is questionable (as operators complying with general duties under the baseline should already be demonstrating sufficient controls).

From feedback received through consultation, it is possible that the application of Option 3 may significantly alter rostering and hours of work for rail safety workers. Benefits may be realised where duty times are limited, resulting in shorter shifts with longer breaks. Rail safety workers may also have greater certainty about their duty time limitations with clear expression in regulatory instruments.

However, this option may remove flexibility, potentially limiting hours of work without a corresponding safety benefit. Rail safety workers often value flexibility for reasons other than safety, to account for social or family commitments.

Union representatives have indicated a degree of discomfort with the inclusion of intra-shift breaks in particular, with potential overlaps with industrial issues. A concern is that, assuming a definition of time-off-task is implemented that is different from an industrially-defined break, that rail safety workers may be afforded fewer true breaks from work (in favour of greater task switching, etc.).

### 9.5.6 Summary

Compared to other options considered, the duty time limitations proposed under Option 3 are based on the most wide-ranging suite of fatigue issues and considerations, taking into account a number of the fatigue-related factors.

As with Option 2, the provision of a 'safety net' may prove beneficial where a rail operator's safety culture maturity is low, where the operator's commitment to safety is questionable, or where a well-meaning operator's approach to fatigue risk management fails to prevent undesirable hours of work. However, the logic of this is tenuous as it hinges on the assumption that the risk-based approach is deficient and currently producing poor safety outcomes, the evidence for which is lacking.

A significant issue raised by operators, is that, in order to comply with the outer limits expressed in this option, the overall risk that rail safety workers are exposed to may inadvertently increase as the limitations may shift an excessive focus on fatigue risk at the expense of others risks in the safety management system.

Further disadvantages are again that the framework may not accord with industry best practice and the specific hours may date in light of technological advancements or emerging science. There is again a risk that defined hours may shift focus away from the management of fatigue towards compliance and that the limits may be used as a rostering target or acceptable practice, thereby inadvertently increasing fatigue.

As opposed to Option 4, the framework under Option 3 does not provide an appreciation of the nature and consequence of the task being performed by the rail safety worker. Additionally, it could allow all dimensions to be extended to the outer limit (that is, neglecting the interaction between the fatigue-inducing dimensions). These factors could permit unsafe hours of work. While the risk management process should prevent this from occurring, the potential for stated limits to become targets and acceptable practice may lead to unsafe outcomes.

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<sup>82</sup> Queensland Transport (2008). *Final report: Rail safety Investigation: QT2140*. Queensland Government, Brisbane, available at [http://www.tmr.qld.gov.au/~-/media/41a882d1-0cd2-476f-af82-560229d3f453/pdf\\_mindi\\_rail\\_incident\\_report\\_part\\_a.pdf](http://www.tmr.qld.gov.au/~-/media/41a882d1-0cd2-476f-af82-560229d3f453/pdf_mindi_rail_incident_report_part_a.pdf).

As with Option 2, it is again questionable as to whether hours prescribed in legislation are, in fact, beneficial to the Regulator and whether prescribed hours may be viewed as superfluous based on the existing regulatory framework, which provides the Regulator with adequate powers to effectively regulate hours of work and rest.

Operators may have difficulty interpreting the requirements under this option and may face significant administrative compliance costs. Furthermore, operators have indicated that the limitations may be excessively limiting, impacting significantly on organisational efficiency and productivity. The economic assessment of this option reflects these concerns. Operators, particularly in the mining sector and freight transport areas, have indicated that the restrictions may impact significantly, requiring additional resources in order to meet existing levels of service.

The concept of intra-shift breaks has raised significant concern with both operators and unions, and their views have been supported by regulators.

The broad coverage of rail safety workers appears reasonable, although may impose significant costs to operators in terms of administrative compliance costs.

## **9.6 Option 4 – Risk-based approach to limiting hours of work and rest with consequence-based categorisation of rail safety workers**

### **9.6.1 Economic assessment**

The economic analysis has assessed Option 4 as being superior to Options 2 and 3, but imposing a higher cost than the baseline and Option 1. *Appendix G: Economic assessment – social cost-benefit analysis* contains the details of the assessment.

### **9.6.2 Safety impacts**

Option 4 represents the regulatory option based on the recommendations of the Expert Panel with subsequent advice of the Fatigue Academic Working Group.

Compared to Option 3, intra-shift breaks are not included in the framework of Option 4. Although not specified as a limit in *Table 4*, the requirements for the fatigue risk management program require that operators take into account and assess the scheduling of work and non-work periods, including time-on-task and rest opportunities in shifts and the total period of time in which work is being carried out; as such, this aspect is still given due consideration. Option 4 takes into account the nature and consequences of the rail safety task being performed, providing the most comprehensive prescribed framework

The impacts associated with this regulatory option are comparable to those for Option 3 and, for the sake of brevity, only the differences in impacts will be discussed in this section.

As opposed to Option 3, the framework under Option 4 provides an appreciation of the nature and consequence of the task being performed by the rail safety worker. This more holistic approach is less likely to permit excessive fatigue due to the inclusion of the aggregate outer limit and more restrictive limitations associated with high-consequence tasks. To the extent that more prescriptive approaches may provide for improved safety outcomes, Option 4 represents the most comprehensive assessment tool.

Under Option 3, operators indicated that the prescribed approach may shift an excessive focus on fatigue risk at the expense of other risks in the safety management system; for example, to comply with the limitations on night work, operators may be required to perform track maintenance work during daytime hours, exposing workers to other risks that may outweigh the fatigue-related risk. Operators indicated that this risk was exacerbated in Option 4, as the inclusion of aggregate outer limits, was more restrictive on, for example, night work.

### 9.6.3 Regulator impacts

Given the increased complexity of this framework when compared with Option 3, operators may have difficulty interpreting the requirements under this option, and it is feasible that the Regulator may need to allocate additional resources to education and assistance for rail transport operators.

Additionally, as operators have indicated that an excessive focus on fatigue risk management may divert attention from overall safety management, regulatory effort may also be disproportionately allocated to undertaking compliance activities rather than focussing on overall safety management and the areas of greatest risk, such as oversight of emergency management and relief practices.

### 9.6.4 Rail transport operator (rolling stock operator and rail infrastructure manager) impacts

Defined hours of work or rest provide unambiguous limitations that are easy for operators and workers to understand and therefore comply with,<sup>83</sup> and clearly identify when the limitations will be exceeded; however, when written to incorporate all relevant factors, they can become difficult to comprehend.<sup>84</sup> This is demonstrated in this option that, while perhaps providing the most comprehensive treatment of working time restrictions under a prescribed approach, is potentially too complex for most operators to implement effectively. Due to the fact that this option addresses the interaction between not only hours of work and rest, but also the nature of the task and the interaction of various fatigue-related dimensions, it involves a degree of complexity, that small or unsophisticated operators have indicated that they would find difficult to understand and therefore comply with.

Compared with Option 3, operators have indicated that, due to the increased complexity of Option 4, there are further cost impositions for the analysis of rosters, redesigning of rostering systems to account for the restrictions and imported costs of documentation to demonstrate compliance to the Regulator. These administrative compliance costs, have contributed to the economic assessment of this option.

Without intra-shift break dimensions included, some operators found this option more palatable, thus providing the favourable ranking against Options 2 and 3.

Both operators and regulators were of the opinion that this level of prescription may be unnecessary where operator safety culture maturity is high and operators are already committed to safety, adding to regulatory burden in administrative compliance costs without a resultant safety benefit. Regulators indicated that typically larger operators would already be performing a comparable risk assessment method under existing fatigue risk management requirements, indicating that this option would be adding a layer of prescription without a resultant benefit. General feedback was that this option would impose significant compliance costs for lower risk operations without a consequential safety benefit.

Some operators indicated that the categorisation method resulted in differing outcomes for a given rail safety task when compared with the *National Standard for Health Assessment of Rail Safety Workers*. As such, the categorisation imposed an additional cost factor.

### 9.6.5 Rail safety worker impacts

Rail safety worker impacts for Option 4 were assessed in the same way as for Option 3.

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<sup>83</sup> Jones CB, Dorrian J Rajaratnam SMW and Dawson D (2005). *Working hours regulations and fatigue in transportation: A comparative analysis*. *Safety Science*, 43: 225-252.

<sup>84</sup> Stewart S, Holmes A, Jackons P and Abboud, R (2006). *An integrated system for managing fatigue risk within a low cost carrier*. Proceedings of the 59<sup>th</sup> Annual International Air Safety Seminar (IASS), Paris, France, available at <http://www.faidsafe.com/news/easyJet-paper.pdf>.

### 9.6.6 Summary

The impacts associated with Option 4 are comparable to those for Option 3.

As opposed to Option 3, the framework under this regulatory option provides an appreciation of the nature and consequence of the task being performed by the rail safety worker. This more holistic approach is less likely to permit excessive fatigue due to the inclusion of the aggregate outer limit and more restrictive limitations associated with high-consequence tasks. To the extent that more prescriptive approaches may provide for improved safety outcomes, Option 4 represents the most comprehensive assessment tool.

Under Option 3, operators indicated that the prescribed approach may shift an excessive focus on fatigue risk at the expense of other risks in the safety management system and indicated that this risk was exacerbated in Option 4, as the inclusion of aggregate outer limits, was more restrictive on, for example, night work. Similarly, an excessive focus on fatigue risk management may divert regulatory attention away from overall safety management, disproportionately allocated to undertaking compliance activities rather than focussing on areas of greatest risk, such as oversight of emergency management and relief practices.

Given the increased complexity of the framework under Option 4 when compared with Option 3, operators may have difficulty interpreting the requirements, and it is feasible that the Regulator may need to allocate additional resources to education and assistance for rail transport operators. Operators indicated that the complexity of the option, including the categorisation, was likely to impose excessive compliance costs without a resultant safety benefit.

However, without intra-shift break dimensions included, some operators found Option 4 more palatable, thus providing the favourable ranking against Options 2 and 3. Although not specified as a limit in *Table 4*, the requirements for the fatigue risk management program require that operators take into account and assess the scheduling of work and non-work periods, including time-on-task and rest opportunities in shifts and the total period of time in which work is being carried out; as such, this aspect is still given due consideration.



## 10. Proposal

Based on the qualitative and economic analysis, Option 1 is proposed for adoption, representing no change to the National Law or accompanying National Regulations as they were endorsed by SCOTI on 4 November 2011.

With respect to the objectives for development of the National Law, Option 1 best meets the requirements in that it represents a nationally consistent regulatory approach and supports the co-regulatory nature of the law, thus streamlining regulatory arrangements and reducing the compliance burden and costs to industry. The advantage of Option 1 primarily lies in the benefits of harmonisation and co-regulation, which promotes efficiency, productivity and innovation, and supports regulated parties to tailor their fatigue risk management program to their specific circumstances.

Concerns may be raised that removal of New South Wales prescribed hours relating to rail safety workers who drive trains signifies a diminution of safety; this is nevertheless not considered to be an accurate interpretation.

Evidence is lacking as to whether the differences in the form of regulation (specifically, between less and more prescriptive approaches) have an impact on fatigue-related risks. It should be acknowledged that the Australian rail industry has a strong safety record, with relatively few accidents and incidents. While it is recognised that fatigue is sometimes implicated in those incidents that do occur, there is a lack of conclusive evidence to indicate that fatigue is a major issue in Australian rail. It is therefore impractical to meaningfully determine the size of the 'fatigue problem' if one, in fact, exists. In general, consultation has revealed that rail transport operators are not presently compelling rail safety workers to undertake excessive working hours, which may indicate that current arrangements are not ineffective (primarily the purely risk-based approach under regulatory oversight, as per Option 1).

The already-established fatigue risk management provisions under the National Law provide the Regulator with the ability to enforce standards as it considers appropriate; as such, the Regulator itself could be viewed as an effective 'safety net', without the need for legislated limits. By empowering the Regulator in respect of working with operators to develop the detail in their safety management systems, the risk-based approach of the fatigue risk management program allows for such specific detail to be required of particular operations where the risk profile suggests this is appropriate.

As such, with a well-informed and skilled Regulator, prescribed hours may be viewed as superfluous based on the existing regulatory framework. Instead, less prescriptive approaches, as demonstrated in Option 1, provide the Regulator with increased flexibility to adjust requirements and improve practices in light of new information and technological innovation. It is this adaptability and responsiveness that underpins the co-regulatory approach and, given the sheer diversity of the Australian rail industry, operating environments and the differing tasks of rail safety workers, it is favourable that this approach is preserved. In line with COAG's principles of best practice regulation, regulatory measures and instruments should be the minimum required to achieve the pre-determined and desirable outcomes.

In addition to introducing additional compliance costs, prescribed limits may themselves generate unsafe outcomes. There is a risk that prescribed hours may shift focus away from the management of fatigue, under the assumption that compliance with the prescribed limitations is sufficient.<sup>85</sup> Their usage may also shift from guidance to reduce excessive fatigue towards a rostering target and acceptable practice, thereby inadvertently increasing fatigue.<sup>86</sup> This effect has been seen in the Australian heavy vehicle industry where the prescribed limits for 'advanced fatigue management' (a

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<sup>85</sup> Stewart S, Holmes A, Jackons P and Abboud, R (2006). *An integrated system for managing fatigue risk within a low cost carrier*. Proceedings of the 59<sup>th</sup> Annual International Air Safety Seminar (IASS), Paris, France, available at <http://www.fadaysafe.com/news/easyJet-paper.pdf>.

<sup>86</sup> Ibid.



similar scheme to co-regulation where heavy vehicle operators are required to demonstrate risk management under the oversight of the National Heavy Vehicle Regulator) have been taken to be the acceptable standard as opposed to their intended use as outer limits. In response to this, an independent Expert Panel has recommended the removal of the prescribed maximum hours, rather remaining silent and relying solely on the risk management approach.<sup>87</sup>

A major risk is that operators may view the prescribed hours as intrinsically 'safe', without due regard to the risk environment, as they are sanctioned by government.

Additionally, while prescribed approaches may shift an excessive focus on fatigue risk at the expense of other risks in the safety management system, Option 1 allows operators to take a more holistic approach, integrating fatigue risk management with the management of other risks in the safety management system, with better overall safety outcomes. Regulatory effort can also be focussed on the areas of greatest risk, rather than disproportionately allocated to compliance activities.

Over-prescription may have significant negative impacts on efficiency and productivity, particularly when mining and freight operations are considered; serving to divert scarce resources to administrative compliance activities rather improved safety outcomes. A high level of prescription also tends to disproportionately impact low-risk railways, which may face increased compliance costs, as a result of the limited scalability of detailed requirements.

It is important to underscore the fact that while Option 1 is favoured as a consequence of the qualitative and quantitative analysis, that does not bring to nought the substantial research and significant work undertaken by the Expert Panel and Fatigue Academic Working Group, which underpinned the development of Option 3 and Option 4 (most notably). While it is recognised that mandating compliance with these options imposes excessive costs due to the diversity of rail operations and the difficulty in defining a 'safety net' that is appropriate across all circumstances, it is strongly recommended that this work be incorporated into guidance material, thus making it widely available and strengthening the capacity of both the Regulator and industry.

Guidelines are explanatory documents, providing practical guidance to operators on how to comply with their duties under the law (in this case, how operators may specify safe hours of work and rest for rail safety workers) and, while compliance is voluntary, the Regulator may nevertheless judge non-compliance with the guideline as non-compliance with the National Law. The authority of the Regulator to enforce standards as it deems appropriate to an operator's risk profile, may lead to better safety outcomes and greater efficiency for industry than a prescribed hours approach. Notably, under Option 1, there are no legislative impediments to compliance tools evolving based on the latest research and emerging science.

It is noted that a key intent of the Rail Safety Regulator Project Office in establishing the Regulator and, indeed a benefit of the Regulator itself, is the up skilling of regulatory officers and promotion of nationally consistent competency in the area of human factors risk management.

Furthermore, to support the transition and to help to develop the guidance material, the National Rail Safety Regulator Project Office has established the Fatigue Implementation Advisory Group, comprising academics, government policy makers, regulator, industry, and union representatives as well as NTC. This group is responsible for providing practical advice to help inform and guide the development of the guidance material on this matter and to develop an implementation plan for the Regulator on the transition to the proposed policy option.

In summary, with a well-informed and skilled Regulator and the provision of high-quality guidance material based on the substantial work undertaken by the Expert Panel and Fatigue Academic Working Group, Option 1 represents best-practice management of fatigue risks in the rail setting. A performance-based approach, supporting the co-regulatory nature of the National Law, this option is seen to best support the adaptability, responsiveness and innovation of the industry. Given the sheer diversity of the industry, not only in operations and operating environments but also rail safety tasks, it is favourable that this approach is preserved for the future success of the Australian rail industry.

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<sup>87</sup> National Transport Reform Independent Expert Panel on Heavy Vehicle Policy Report, report to the 32<sup>nd</sup> ATC meeting 24 September 2010.

# 11. Consultation

## 11.1 Policy development

The development of the policy options presented in this draft regulatory impact statement has been shaped by significant preliminary analysis and consultation with a variety of stakeholders.

In developing the National Law, NTC and the National Rail Safety Regulator Project Office released a number of policy papers and convened stakeholder workshops over 2010 and 2011. Stakeholders consulted during this process included Commonwealth, state and territory government policy makers, rail safety regulators, rail industry members, rail industry associations and unions.

Substantial progress was made in developing the National Law fatigue risk management provisions during 2010, with elements of the mandatory fatigue risk management program developed through extensive consultation and agreed by stakeholders. These agreed provisions are reflected in the National Law and were assessed in its accompanying regulatory impact statement.<sup>88</sup>

Concurrently over this period, various submissions were received from state and territory policy makers and regulators, industry representatives and the Rail, Tram and Bus Union on the matter of prescribed hours of work and rest; these submissions have informed the discussion in this draft regulatory impact statement and served to provide the basis for development of the policy options presented in this document.

The issue of whether the National Law should prescribe maximum hours of work or minimum periods of rest for rail safety workers remained outstanding as of late 2010. The various decision-making tiers, including the Rail Safety Advisory Committee (comprising policy makers from the Commonwealth, state and territory governments as well as regulators, industry and union representatives), Jurisdictional Rail Safety Advisory Group (policy makers from the Commonwealth, state and territory governments) and Rail Safety Regulation Reform Project Board (a sub-group of the Transport and Infrastructure Senior Official's Committee), were unable to reach agreement and elevated the matter to ATC.

In response, ATC directed the establishment of an Expert Panel, comprising policy, academic and industry representatives. The Expert Panel was requested to consider whether the National Law should specify maximum hours of work and/or minimum periods of rest and to which rail safety workers such limits should apply to (amongst other matters). The Expert Panel's recommendations were endorsed by ATC in May 2011 on the basis that the specific boundaries (the specific hours of work or rest that form a 'safety net') indicatively provided for in the report be developed.<sup>89</sup>

To complete this task, NTC established the Fatigue Academic Working Group, a panel of four academic experts in the area of fatigue management. The chosen duty time limitations were developed on the basis of current scientific knowledge in the fatigue domain and expert advice, drawing on necessary additional research as required.

Following this work, there was extensive consultation undertaken with the Rail Safety Regulation Reform Project Board which, based on the Fatigue Academic Working Group advice, was instrumental in the development of regulatory options that expressed that knowledge in workable policy; these are represented in Options 3 and 4.

Through a consultative process aimed primarily at gathering economic data to support the economic assessment of the options (discussed below), state and territory policy, industry, union

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<sup>88</sup> Rail Safety National Law and accompanying regulatory impact statement (November 2011), available at <http://ntc.gov.au/viewpage.aspx?ArealD=34&DocumentId=1925>.

<sup>89</sup> The Expert Panel report is available at <http://www.nrsrproject.sa.gov.au/publications>.

and regulator stakeholders became acquainted with the policy options under consideration and feedback was obtained through open discussion forums.

From this feedback, it has become evident that all stakeholders support the established risk-based approach of the National Law and that the diversity of rail operations and rail safety tasks is a complicating factor for determining safe hours of work and rest. However, the issue of whether the law should specify further controls on hours of work and rest has been an area of divergence, and stakeholders have been divided in their views on whether further prescription is required.

For the most part, states and territory governments supported their existing approaches to the matter. Victoria, South Australia, Western Australia, Tasmania and the Northern Territory supported the purely co-regulatory approach of Option 1. Queensland supported Option 2 based on the recent regulatory amendments mandating hours of work and rest emulating the New South Wales. New South Wales supported the inclusion of some limitations on hours of work and rest, but most notably sought assurance that the proposed option will not signify a diminution of safety for rail safety workers who drive trains.

Union stakeholders were in favour of the inclusion of legislated limits on hours of work and rest, and therefore were generally in support of Option 2. Moreover, union stakeholders believed that consideration of this matter should extend to family and social considerations, rather than those solely related to safety.

The majority of industry stakeholders strongly supported Option 1, being the option that represents the most adaptable approach. In light of some operators investing significant resources to developing innovative controls to mitigate fatigue-related risks, this option was preferred to provide the most flexibility and support the productivity and competitiveness of operations.

It should be noted that the views represented above are not final positions, and are expected to be further elaborated on or amended during the public comment period.

## **11.2 Preparation of the draft regulatory impact statement**

A previous draft regulatory impact statement on the National Law was published for public comment in July 2011. This early draft contained several of the options included in this document, although these options were ultimately not presented in the final regulatory impact statement; rather the matter was deferred until the recommendations of the Expert Panel were received. As such, all options regarding hours of work and rest were left for consideration in this draft regulatory impact statement. Nevertheless, the feedback received from the initial round of public comment has informed the discussion in this draft regulatory impact statement. Additionally, economic data gathered during preparation of the previous regulatory impact statement were reviewed and incorporated into *Appendix G: Economic assessment – social cost-benefit analysis* where appropriate.

Furthermore, in preparing this draft regulatory impact statement, NTC engaged with a number of stakeholders. Input has been received from industry members and union representatives, as well as state and territory rail safety policy departments and regulators, who have provided ongoing advice and feedback.

The preparation of this draft regulatory impact statement involved significant preliminary analysis and consultation in order to gather qualitative and quantitative information that has been utilised as the basis of the impact assessment. Representatives from the National Rail Safety Regulator Project Office and NTC engaged state and territory policy, industry, union and regulator stakeholders to gather this information during December 2011. Through this consultative process, stakeholders became acquainted with the policy options under consideration and feedback was sought through open discussion forums.

Comprehensive surveys, designed primarily to gather data to support the economic assessment, but also to gain qualitative impact advice, were distributed during these forums. Additionally, the Rail Safety Advisory Committee (comprising policy makers from the Commonwealth, state and territory governments as well as regulators, industry and union representatives) and the Rail Safety Regulation Reform Project Board (a sub-group of the Transport and Infrastructure Senior Official's Committee) have been consulted prior to release of this document for public comment.

### **11.3 Public comment**

Public comment is now invited on this draft regulatory impact statement and the proposed option for the further regulation of hours of work and rest for rail safety workers. Feedback will be considered in determining whether to further amend the draft proposal and National Law, recognising that further policy development may be required.

Details of the comments received during this period will be incorporated and documented in the final regulatory impact statement, which will be submitted to the SCOTI for consideration in May 2012.

## 12. Implementation and review

### 12.1 Implementation of the National Law

Subject to approval by the Ministerial Council, the National Law will be enacted in the South Australian Parliament. The remaining states and territories will then implement applying legislation that will reference the South Australian rail safety legislation (the National Law) as their own legislation, thus repealing existing state and territory rail safety legislation. Commencement is scheduled to take place by January 2013.

The National Regulations may be made by the Governor of South Australia, on the unanimous recommendation of the Ministerial Council (as prescribed in section 264 of the National Law).

The National Law does not include consequential amendments arising out of the Law. Each state and territory adopting the Law is to enact an Act incorporating the consequential amendments, which may be the Act that adopts the Law. Nor does this version of the National Law include transitional provisions providing for the change from the operation of a state or territory's current law to the operation of the National Law. The transitional arrangements are to be developed in tandem with the consequential amendments. It is expected that the National Law that is introduced into the South Australia Parliament will include transitional provisions that can generally apply to all states and territories, and that each state or territory's Act adopting the Law will include the transitional provisions that are specific to that state or territory.

### 12.2 Guidance material

The National Rail Safety Regulator Project Office has committed to the development of guidance material to accompany the law prior to implementation in 2013. Guidance material will be developed to assist rail transport operators to comprehend and comply with their duties under the law and will also assist the Regulator to interpret the requirements of the law and determine what is reasonably practicable.

Such guidance material will cover accreditation, drug and alcohol requirements and fatigue risk management requirements, relating not only to hours of work and rest, but also the broader fatigue risk management program requirements, amongst other matters.

### 12.3 Implementation of the proposed policy option

The proposed option, Option 1, represents no change to the National Law and National Regulations as they were endorsed by SCOTI on 4 November 2011.

It is important to underscore the fact that while Option 1 is favoured as a consequence of the qualitative and quantitative analysis, that does not bring to nought the substantial research and significant work undertaken by the Fatigue Academic Working Group, which underpinned the development of Option 3 and Option 4 (most notably).

It is strongly recommended that this work be incorporated into the guidance material referred to above, making it widely available and strengthening the capacity of both the Regulator and industry.

To support the transition and to help to develop the guidance material, the National Rail Safety Regulator Project Office has established the Fatigue Implementation Advisory Group, comprising academics, government policy makers, regulator, industry, and union representatives as well as NTC. This group is responsible for providing practical advice to help inform and guide the development of the guidance material on this matter and to develop an implementation plan for the Regulator on the transition to the proposed policy option.

## 12.4 Transition and funding arrangements

In line with COAG's decision on 7 December 2009 to implement a national regulator, the National Rail Safety Regulator Project Office has been developing and implementing a change management plan to support the transition from individual state and territory rail safety regulators, to a National Regulator. The objective is to ensure implementation is achieved in a professional and inclusive manner, risks and problems are identified and communication and consultation are undertaken to the highest of standards.

A change management strategy is being developed so that all affected staff currently working in state and territory regulators' offices and their unions are informed of and engaged in transitional arrangements to the National Regulator.

It is noted that a key intent of the Rail Safety Regulator Project Office in establishing the Regulator and, indeed a benefit of the Regulator itself, is the up skilling of regulatory officers and promotion of nationally consistent competency in the area of human factors risk management.

A cost and capability review, arranged by the Project Office, has identified the outputs and activities of state and territory regulators and the resources, costs and funding required fulfilling their roles.

At the COAG meeting of 19 August 2011, all transport ministers signed the Inter-governmental Agreement on Rail Safety Regulation and Investigation Reform.<sup>90</sup> The agreement included matters for the objectives, scope, functions, structure, governance arrangements, roles and responsibilities of the Regulator.

## 12.5 Evaluation

Following implementation by states and territories, NTC will conduct an Evaluation Review. This review will focus on identifying areas in which states and territories may have differed from the National Law (as enacted by South Australian Parliament) in their applying law.

## 12.6 Maintenance program

NTC's general procedure includes a maintenance program for ongoing review of the National Law, and the process commenced in late 2011.

Any subsequent amendments to the National Law following implementation will be developed for consideration by the Ministerial Council in accordance with the provisions of the COAG *Best Practice Regulation – A Guide for Ministerial Councils and National Standard Setting Bodies*.

## 12.7 Review

Formal review of the National Law will occur every five years following implementation. The reviews will be conducted to ensure that the legislation is meeting the objectives as outlined by COAG and as stated in the National Partnership Agreement.

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<sup>90</sup> Inter-governmental Agreement on Rail Safety Regulation and Investigation Reform, available at [http://www.coag.gov.au/coag\\_meeting\\_outcomes/2011-08-19/docs/Rail\\_IGA-19August2011.pdf](http://www.coag.gov.au/coag_meeting_outcomes/2011-08-19/docs/Rail_IGA-19August2011.pdf).

# Appendix A: Fatigue risk management program requirements

The National Rail Safety Regulations (the National Regulations) include the following prescribed requirements for the mandatory fatigue risk management program.

## 29—Fatigue risk management program

- (1) For the purposes of section 116 (Fatigue risk management program) of the Law, when preparing a fatigue risk management program, a rail transport operator must take into account, and assess, any fatigue-related risks to safety arising from factors, including the following:
  - (a) scheduling of work and non-work periods, including time-on-task and rest opportunities in shifts and the total period of time in which work is being carried out;
  - (b) call-in, on-call and lift-up and lay-back arrangements and extended hours of work, including overtime;
  - (c) the impact of work scheduling and relief practices generally on social and psychological factors that may impact on performance and safety, including the effect of scheduling practices, schedule predictability and irregularity and control over work hours on sleep loss, performance and safety;
  - (d) physiological factors arising out of work practices affecting rail safety workers, such as the effect on worker alertness and recovery of the time when work is undertaken, the length and frequency of breaks, commuting time, circadian effects, extended wakefulness, chronic sleep loss effects, and sleep inertia;
  - (e) the kinds of rail safety work being carried out, including—
    - (i) work that requires significant physical exertion or high cognitive task demand; and
    - (ii) the degree of monotony or boredom or low cognitive task demand of the work;
  - (f) the variations in shifts and rest periods that may be required by different rail safety work requirements, including different routes, crew-call practices and predictability of working hours;
  - (g) the suitability of rest environments, including barracks, rest houses and relay vans provided for rail safety workers by the operator;
  - (h) the physical environment in which rail safety work is to be carried out, including climatic conditions, noise, vibration and fumes;
  - (i) fatigue risks arising from any one-off or occasional circumstances in which rail safety work may be required to be carried out, including in emergencies or under degraded or abnormal conditions, subject to the working hours being dependent on the rail safety workers' indication of their fitness to continue;
  - (j) relevant developments in research related to fatigue and any technology that may be applied to manage work-related fatigue.
- (2) A rail transport operator's fatigue risk management program must establish and maintain documented procedures to manage, so far as is reasonably practicable, fatigue related risks, including—
  - (a) specified work scheduling practices and procedures that provide for—
    - (i) safe hours of work; and
    - (ii) safe periods of time between shifts; and



- (iii) sufficient rail safety workers to be available to meet reasonably foreseeable demands for relief arrangements; and
  - (b) provisions for monitoring of hours of work, in particular—
    - (i) procedures for monitoring how actual hours of work of rail safety workers compare with planned hours of work for rail safety workers; and
    - (ii) procedures for monitoring the impact to changes to planned rosters due to shift swapping, overtime and on-call working; and
  - (c) provision of appropriate education and information in relation to the identification and management of fatigue risks that are relevant to the rail safety work being undertaken.
- (3) For the purposes of subregulation (2)(a)(i) and (ii), hours of work or periods of time between shifts are taken to be safe if the effect of implementing those hours or periods is sufficient to manage risks arising from fatigue so far as is reasonably practicable.
- (4) In this regulation—

a ***lift-up and lay-back arrangement*** means an arrangement where a rail safety worker commences a shift at an earlier or later time than the time for which the worker was originally rostered.

# Appendix B: Regulatory and non-regulatory tools

The following discusses how regulatory instruments are used to support policy objectives and how they relate to each other. The arguments presented are in the specific context of the National Rail Safety Law (the National Law) and may not apply to other bodies of law.

## 1 The Act or Regulations (the National Law)

Primary law (the Act) and subsidiary law (the Regulations) prescribe requirements for, in the case of rail safety law, rail transport operators, rail safety workers, contractors, designers, manufacturers and other duty holders.

Legislation may be:

- prescriptive: detailed and specific in nature and specifies particular behaviours that must be undertaken by the regulated entity to ensure compliance
- performance-based: specifies outcomes, rather than inputs, and provides choices to the regulated as to how to comply
- process-based: requires the regulated to develop and implement systematic approaches to dealing with the regulatory issue.

The regulatory types are not mutually exclusive and regulatory best practice can involve implementing appropriate combinations of the different types of instrument. For example, process based regulation, designed to ensure integrated management of a range of risks, might be supplemented by prescriptive standards relating to a small number of highly critical risks, particularly where there are relatively few choices as to appropriate risk management approaches to those risks.

This is true of the National Law, which is largely performance- and process-based. The National Law sets out the 'general duties' in primary legislation (the Act), which are then addressed via more specific regulation dealing with particular areas of concern.

For a requirement to have the force of law (that is, be mandatory), it must be included in legislation. However, compliance and enforcement may be compromised when the interpretation of provisions in law is subjective or unclear. This presents a challenge for policy makers to strike a balance between setting clear and enforceable standards whilst not unduly restricting operators in determining how to comply with them. Codes of practice and guidelines are commonly utilised to allow flexibility in achieving compliance with legislation due to their different (reduced) status in law.

In terms of approval, the National Law and National Regulations must be approved by the Ministerial Council and developed in consultation with policy makers, rail transport operators and rail safety workers.

## 2 Approved code of practice

Approved codes of practice provide practical guidance on methods of complying with a duty or obligation in law. An approved code may provide guidance by:

- identifying risks and hazards that apply to a given area of rail safety
- identifying appropriate countermeasures to manage those risks and hazards
- providing more detail than would be feasible in the National Law or National Regulations.

Approved codes of practice are of particular value where there is associated uncertainty or a lack of relevant knowledge amongst operators.

Where compliance requirements vary with operational circumstances, it would be poor practice to include such advice within the law, in an exhaustive or restrictive manner. Additionally, where such

requirements lack transparency, placing sole responsibility on rail transport operators to determine how to comply may also be unreasonable. By including advice in an approved code of practice it is possible to provide a degree of assurance for how to comply, while still allowing operators to devise alternative means that achieve at least an equivalent standard of rail safety.

Sections 249 and 250 of the National Law detail the status of approved codes of practice in the law, which is aligned with the approach taken in Model Work Health and Safety legislation. A code is not legally enforceable; rather, it is imparted 'evidentiary status', constituting only evidence of what is known about a hazard or risk and what is reasonably practicable to manage it. A direction included in an improvement notice or prohibition notice may refer to an approved code of practice (refer to section 188 (Directions in notices) of the National Law)

Thus, an approved code of practice is admissible in court proceedings as evidence of whether a duty or obligation under the law has been complied with. The court may have regard to the code as evidence of what is known about a hazard or risk, risk assessment or risk control to which the code relates and rely on the code in determining what is reasonably practicable in the circumstances to which the code relates. However, there is no restriction on operators from introducing evidence of compliance with this Law in a manner that is different from the code, but (importantly) provides a standard of rail work safety that is equivalent to or higher than the standard required in the code.

Codes of practice are intended as a foundation on which a compliance system may be built; where a rail transport operator faced circumstances and risks not addressed in a code of practice, they would be required to manage those risks, above and beyond what may be included in a code of practice.

Some stakeholders have argued that any adoption of 'codes' in this respect should distinguish between those dealing with issues such as health, fatigue and drugs and alcohol and those associated with infrastructure and rolling stock, and so on, which involve engineering standards in which the issues are more concrete. Fatigue management is affected by human factors, which are not so easily quantified.

The approval process for approved codes of practice is similar to that for the National Law. Under section 249(2) of the National Law, a code of practice can only be approved by Ministerial Council and must be developed in consultation with each state and territory, rail transport operators/employer organisations, rail safety workers and any relevant union.

### 3 Guidelines

Guidelines are similar to codes of practice in that they are explanatory documents, providing practical guidance to operators on compliance with the law. The major difference between codes of practice and guidelines is that, under the National Law, a court has greater discretion in interpreting the significance of guidelines. This does not mean that a guideline would necessarily be given greater or less status than a code of practice by a court.

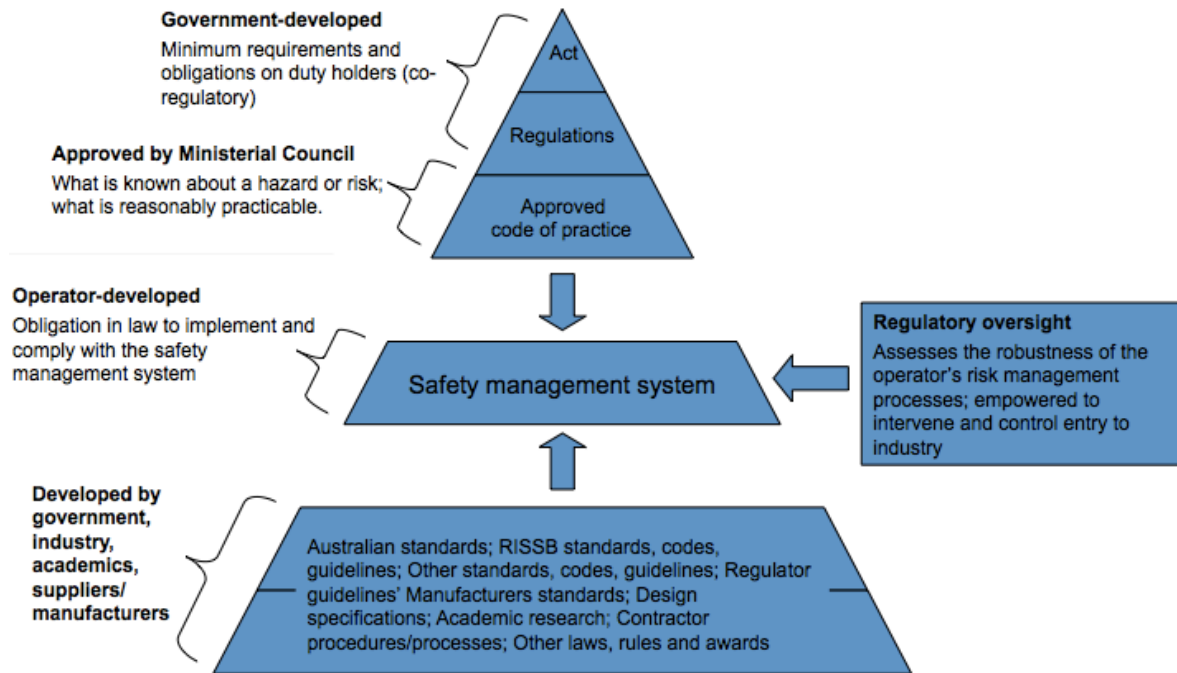
A failure to comply with guidelines issued by the Regulator does not itself give rise to any civil or criminal liability. However, in the event that a duty holder is not managing risks to a level deemed appropriate by the Regulator, the Regulator has the ability to enforce standards as it considers appropriate and may require compliance with included advice in guidance material.

There is no formal approval process for guidelines and no explicit requirements for how consultation must be undertaken. Therefore, guidelines primarily serve to articulate the types of measures that the Regulator believes may be necessary to achieve compliance with duties in the National Law.

### 4 Other tools

A variety of other documents and tools are available. Operators may use these tools to assist in developing and maintaining the safety management system. The Regulator may review these documents to educate itself so as to determine what is reasonably practicable. A number of these are shown in the figure below.

**Figure 1. Regulatory and non-regulatory tools.**





# Appendix C: New South Wales fatigue management provisions for rail safety workers who drive trains

## **Schedule 2 of the *Rail Safety Act 2008* (NSW)**

### 1 Interpretation

- (1) For the purposes of this Schedule, the length of a shift worked or to be worked by a rail safety worker includes all time between the signing on time and the signing off time of a shift.
- (2) For the purposes of this Schedule, a shift that exceeds 11 hours but is less than 12 hours is taken to be a 12 hour shift.

### 2 Working hours for rail safety workers driving freight trains

The following conditions of work apply to rail safety workers who drive freight trains:

- (a) In the case of a 2 person operation (where the second person is a qualified train driver, including a qualified train driver who is learning the route or undergoing an assessment), the maximum shift length to be worked is 12 hours.
- (b) In the case of any other 2 person operation, the maximum shift length to be worked is 11 hours.
- (c) In the case of a one person operation, the maximum shift length to be worked is 9 hours.
- (d) In the case of a one person operation, there is to be a minimum break of not less than 30 minutes taken at some time between the third and fifth hour of each shift.
- (e) There is to be a break of at least 11 continuous hours between each shift worked by a rail safety worker where the worker ends a shift at the home depot.
- (f) There is to be a break of at least 7 continuous hours between each shift worked by a rail safety worker where the worker ends a shift away from the home depot and the break is taken away from the home depot.
- (g) A maximum number of 12 shifts is to be worked in any 14-day period but a maximum number of 6 shifts of 12 hours is to be worked in any 14-day period.

### 3 Working hours for rail safety workers driving single manning passenger trains

- (1) The following conditions of work apply to rail safety workers who drive passenger trains in a one person operation:
  - (a) The maximum shift length to be worked is 10 hours for the driver of an interurban or long distance passenger train or 9 hours for the driver of a suburban train.
  - (b) There is to be a break of at least 11 continuous hours between each shift worked by a rail safety worker where the worker ends a shift at the home depot.
  - (c) There is to be a break of at least 7 continuous hours between each shift worked by a rail safety worker where the worker ends a shift away from the home depot and the break is taken away from the home depot.
  - (d) A maximum number of 12 shifts is to be worked in any 14-day period.
- (2) The conditions of work set out in clause 2 (a), (b) and (e)–(g) apply to rail safety workers who drive passenger trains in a 2 person operation.

#### 4 Train drivers who are transported to home depot or rest place

- (1) This clause applies to rail safety workers who drive trains and who travel to a home depot, or to a place provided for rest between shifts (a barracks), as passengers in a train or other vehicle provided by the rail transport operator.
- (2) The following rules apply in relation to any such worker:
  - (a) the period between signing on for a shift and reaching the home depot or barracks must not exceed 16 hours,
  - (b) for the purposes of applying the requirements of clauses 2 and 3 in relation to length and number of shifts (and despite clause 1), time spent travelling to the home depot or barracks is not taken to be part of the shift worked,
  - (c) for the purposes of applying the requirements of clauses 2 and 3 in relation to breaks between shifts, the break between shifts commences when the worker reaches the home depot or barracks,
  - (d) any such worker must not undertake any rail safety work or drive any motor vehicle after commencing to travel to the home depot or barracks and before signing off at the home depot or barracks.
- (3) Despite subclause (2), any such worker is for any other purpose taken to have been rostered on for a shift ending when the worker signs off at the home depot or the barracks.

#### 5 Emergencies and accidents

- (1) The requirements of this Schedule do not apply in the event of:
  - (a) an accident or emergency, or
  - (b) any urgent circumstances approved by the ITSRR, or
  - (c) any other unforeseeable circumstances, that make it necessary to contravene this Schedule to avoid a serious dislocation of train services if there is no reasonably practicable alternative,if the driver or drivers concerned indicate their fitness to work the extended hours.

#### (2) In this clause:

*emergency* means an emergency arising out of an actual or imminent event, such as fire, flood, storm, earthquake or explosion, that:

- (a) endangers, or may endanger, the safety of persons, or
- (b) destroys or damages, or may destroy or damage, property.

#### 6 Requirements of Schedule minimum standards

The requirements of this Schedule are minimum standards and do not preclude other conditions of work, such as shorter or less frequent shifts than those specified by this Schedule, from being provided.

#### 7 Relationship with State industrial instruments

Except as provided by the regulations, this Schedule prevails over any inconsistent State industrial instrument (whether made before or after the commencement of this clause) to the extent that this Schedule provides for shorter hours of work or additional or longer breaks from work than are provided for by the State industrial instrument.



## **Exemption provision contained within *Rail Safety (General) Regulation 2008 (NSW)***

### 14 Alternative provisions for fatigue management

- (1) The ITSRR may, on application by a rail transport operator, exempt the operator from the requirements of section 20 (2) of the Act.
- (2) An exemption under this clause is subject to the following conditions:
  - (a) that the rail transport operator carries out the following risk assessment and control measures to the satisfaction of the ITSRR:
    - (i) the operator identifies and assesses the major fatigue-related safety risks associated with the operations for which the exemption is sought, including any risks associated with any proposed operating standards,
    - (ii) the operator identifies and implements adequate controls to manage the risks, including operating standards to replace the requirements contained in Schedule 2 to the Act,
    - (iii) the operator specifies the evidence used to develop the operating standards,
    - (iv) the operator consults with those of its rail safety workers who are affected by the exemption in relation to the proposed operating standards,
  - (b) that the operator implements a system to monitor and report on the operation of the controls to manage the risks, being a system that is capable of monitoring actual hours worked against the operating standards, and the operator audits the operation of that system,
  - (c) that the operator reviews the operating standards when required by any incident or change in the nature of work (including patterns of work and duties of rail safety workers) covered by the exemption, or when there is reasonable evidence that the operating standards are no longer valid, and obtains the approval of the ITSRR to any changes to the operating standards,
  - (d) that the rail safety work is carried out in a way that complies with this Regulation,
  - (e) that the rail safety work is carried out in accordance with any applicable industrial or other agreement or award relating to the employment of the rail safety workers who carry out the work,
  - (f) that the operator complies with any requirements made by the ITSRR to provide information as to compliance with the conditions specified in this subclause,
  - (g) that the operator complies with any requirements made by the ITSRR with respect to operations covered by the exemption,
  - (h) any limitation on the period of the exemption imposed by the ITSRR in respect of a particular rail transport operator or class of rail transport operators.
- (3) An application for an exemption under this clause is to be made in writing in the form approved by the ITSRR.
- (4) The ITSRR may cancel an exemption under this clause in respect of a rail transport operator or a class of rail transport operators or an exemption referred to in subclause (5).



# Appendix D: Queensland fatigue management provisions for rail safety workers who drive trains

## Subdivision 2 of *Transport (Rail Safety) Regulation 2010 (QLD)*

### 19A Purpose of sdiv 2

The purpose of this subdivision is to state, for section 19(2), the work hours and rest periods that apply to a train operator's train driver.

### 19B Standard work hours and rest periods

- (1) This section applies if the train driver drives the train operator's train other than under an alternative work and rest hours approval.
- (2) The length of the train driver's shift must not be more than—
  - (a) if the driver drives a train as a one-driver operation for any period during the shift—9 hours; or
  - (b) otherwise—12 hours.
- (3) For subsection (2), the train driver drives a train as a **one-driver operation** for a period if the driver is the only person responsible for driving the train for the period.
- (4) Also, if, during a shift, the train driver drives a passenger train on an urban journey, the driver must not spend more than 8 hours of the shift driving trains.
- (5) The train driver's rest period must be at least—
  - (a) 12 hours; or
  - (b) if the driver's shift ending immediately before the rest period starts ended at an away depot—8 hours.
- (6) In any 14 day period, the train driver—
  - (a) must not carry out work in relation to railway operations in more than 12 shifts; and
  - (b) must not carry out work in relation to railway operations for more than 132 hours.
- (7) In this section—

**away depot**, for a train operator's train driver, means a place, other than the driver's home depot, provided or arranged by the operator as a place for the driver to rest between shifts.

**home depot**, for a train operator's train driver, means the work location identified as the driver's home depot in the driver's contract of employment, contract of training or contract for services.

**length**, of a shift of a train operator's train driver, means the time between when the driver signs on to start the shift and when the driver signs off to end the shift.

### 19C Alternative work hours and rest periods

- (1) This section applies if the train driver drives the train operator's train under an alternative work and rest hours approval.
- (2) The train driver's shifts and rest periods must comply with the alternative work hours and rest periods the subject of the alternative work and rest hours approval.

### 19D Transitioning between different work hours and rest periods

- (1) This section applies to the train driver if the following happens (a **work arrangement**

**change)—**

(a) for a train driver who is driving a train other than under an alternative work and rest hours approval—the driver starts driving a train under an alternative work and rest hours approval;

(b) for a train driver who is driving a train under an alternative work and rest hours approval—

(i) the alternative work hours and rest periods the subject of the approval are varied; or

(ii) the driver starts driving a train other than under an alternative work and rest hours approval; or

(iii) the driver starts driving a train under another alternative work and rest hours approval.

(2) Subject to subsection (3), the work hours and rest periods applying to the train driver under section 19B or 19C immediately before the work arrangement change happens continue to apply to the driver until—

(a) if the driver is in the middle of a rest period when the change happens—the end of the rest period; or

(b) otherwise—the end of the driver's first rest period after the change.

(3) The length of the rest period mentioned in subsection (2) must be the longer of the following—

(a) the minimum rest period under the work hours and rest periods applying to the train driver under section 19B or 19C immediately before the work arrangement change happens;

(b) the minimum rest period under the work hours and rest periods applying to the train driver under section 19B or 19C immediately after the work arrangement change happens.

(4) The work hours and rest periods applying to the train driver under section 19B or 19C immediately after the work arrangement change happens start to apply to the driver when the rest period mentioned in subsection (2) ends.

### **19E Exception for accident or emergency**

Sections 19B to 19D do not apply to the train driver if—

(a) either—

(i) an accident or emergency happens; or

(ii) other urgent or unforeseeable circumstances arise that make it necessary for the driver to contravene the sections to avoid serious disruption to the train operator's railway services, because there is no reasonable alternative available; and

(b) the driver reasonably believes the driver is not fatigued to the extent that the driver's ability to carry out rail safety work safely is impaired.

*Note—*

Under section 35 of the Act, a rail safety worker has a duty to not, intentionally or recklessly, place at risk the safety of another person while carrying out rail safety work on or in the immediate vicinity of rail infrastructure.

### **Subdivision 3 Approval of alternative work hours and rest periods for train drivers**

#### **19F Approval may be granted**

- (1) The chief executive may approve alternative work hours and rest periods for a train operator's train drivers for the operator's railway operations of a stated scope and nature.
- (2) For subsection (1), the stated scope and nature of the railway operations includes—
  - (a) the railway operations for which the approval is granted under subsection (3); and
  - (b) details of the nature of the railway operations mentioned in paragraph (a), including, for example—
    - (i) the railway tracks, and routes, in relation to which the railway operations are carried out; or
    - (ii) the type of train used to carry out the railway operations; or
    - (iii) the type of service provided by the railway operations.
- (3) An approval under subsection (1) may be granted for 1 or more of the following—
  - (a) all or stated railway operations;
  - (b) a service or aspect, or part of a service or aspect, of stated railway operations.

#### **19G Consultation requirement**

A train operator intending to apply for approval, under this subdivision, of alternative work hours and rest periods for the operator's train drivers must—

- (a) prepare a proposed alternative work hours and rest periods management plan for the alternative work hours and rest periods; and
- (b) so far as is reasonably practicable, consult with the following persons about the proposed management plan—
  - (i) rail safety workers who are likely to be affected by the plan, including train drivers who would be required to comply with the alternative work hours and rest periods;
  - (ii) workplace health and safety representatives, within the meaning of the Work Health and Safety Act, representing any of the persons mentioned in subparagraph (i);
  - (iii) unions representing any of the persons mentioned in subparagraph (i).

#### **19H Application for approval**

- (1) A train operator may apply to the chief executive to approve alternative work hours and rest periods for the operator's train drivers for the operator's railway operations of a stated scope and nature.
- (2) The application for the approval must—
  - (a) be in the approved form; and
  - (b) state the following—
    - (i) the scope and nature of the railway operations for which the approval is sought;
    - (ii) details of the alternative work hours and rest periods for which the approval is sought;
    - (iii) whether or not the applicant—
      - (a) has alternative work hours and rest periods approved under a corresponding law; or

(b) has applied for approval of alternative work hours and rest periods under a corresponding law; and

(c) include an alternative work hours and rest periods management plan for the alternative work hours and rest periods for which the approval is sought; and

(d) include any information the applicant used to prepare the management plan mentioned in paragraph (c); and

(e) include details of the consultation about a proposed alternative work hours and rest periods management plan for the alternative work hours and rest periods for which the approval is sought undertaken by the applicant under section 19G, including, for example, the following details—

(i) the persons, or groups of persons, who were consulted;

(ii) when and how the consultation was carried out;

(iii) the views about the proposed management plan expressed by the persons consulted;

(iv) the changes made to the proposed management plan as a result of the consultation.

(3) The chief executive may, by notice, require the applicant—

(a) to supply further information; or

(b) to verify by statutory declaration any information supplied to the chief executive.

## **Part 8 Transitional provision for Transport (Rail Safety) Amendment Regulation (No. 1) 2012**

### **52 Application of particular provisions**

The following provisions do not apply in relation to a train operator's railway operations until 11 February 2013—

- section 19(2)
- division 7A, subdivision 2
- division 8A
- section 27(2).

# Appendix E: Fatigue risk management practices in rail internationally

Regulators in other countries vary more widely in their approaches to fatigue risk management regulation, with a range of prescriptive, process/procedure-based and multi-faceted approaches adopted.

Australia's regulation of hours of work and rest in the rail industry is relatively unique when compared with international settings. Internationally, there has historically been a significant reliance on prescriptive restrictions on hours of work. The general trend in international rail settings and in other transport industries has been to move away from this reliance on traditional prescriptive working time approaches towards more risk-based approaches. However, the movement has not been complete, and it remains unclear whether this is for historical reasons or because the inclusion of such restrictions is viewed as sound policy. In contrast, Australian rail safety regulation has not included such prescriptive arrangements, instead relying by and large on the co-regulatory approach.

The comparatively progressive approach to the management of fatigue-related risks in rail as outlined in the *National Rail Safety Guideline: Management of Fatigue in Rail Safety Workers*<sup>91</sup> has been cited internationally as outlining favourable practices that may be applicable to other transport industries.<sup>92</sup>

## 1. United States

The United States adopts a process and procedure based regulatory approach focusing on the requirement for operator fatigue management programs, but also retains outer hour limitations for rail workers.

Working hours for rail workers in the United States were, from 1907 until recently regulated under the *Hours of Service Act 1996*, which had been amended several times and managed fatigue through prescriptive duty limitations and minimum break restrictions. The *Rail Safety Improvement Act 2008*, which came into effect in July 2009, provided a major reform and included new provisions regarding hours of service.

Specifically, the *Rail Safety Improvement Act 2008* has amended the Hours of Service law to require at least 10 consecutive uninterrupted hours off-duty for train and signal employees (previously 8 hours), and a maximum of 12 consecutive hours on duty. A maximum of 276 hours per calendar month is prescribed for most train employees, including time spent waiting or in deadhead transportation or other mandatory work for the carrier. Also, no freight railroad employee covered by the Hours of Service law may be called to work unless they have had at least 10 uninterrupted hours off during the prior 24 hour period. Employers are prohibited from disrupting an

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<sup>91</sup> National Transport Commission (2008). *National rail safety guideline: Management of fatigue in rail safety workers*. National Transport Commission, Melbourne, available at [http://www.ntc.gov.au/filemedia/Reports/NRSG\\_FatigueManagement\\_June2008.pdf](http://www.ntc.gov.au/filemedia/Reports/NRSG_FatigueManagement_June2008.pdf).

<sup>92</sup> European Agency for Safety and Health at Work (2011). *European Risk Observatory Report – OSH in figures: Occupational Safety and Health in the Transport Sector – an overview*. Publications Office of the European Union, Luxembourg, available at [http://osha.europa.eu/en/publications/reports/transport-sector\\_TERO10001ENC](http://osha.europa.eu/en/publications/reports/transport-sector_TERO10001ENC).



employee's rest by communicating with the employee during their minimum off-duty period of 10 consecutive hours, except in emergency situations.<sup>93</sup>

In addition to meeting these restrictions, railroad carriers are required to develop a railroad safety risk reduction program incorporating a fatigue management plan. The carrier is required to consider the inclusion of a number of factors in their fatigue management plan including, among others, fatigue training and education for employees; scheduling practices relating to employee fatigue and cumulative sleep loss; opportunities for quality sleep at lodging facilities; and avoidance of abrupt changes in rest cycles.<sup>94</sup>

Effective 15 October 2011, the Federal Railroad Administration further amended the hours of service regulations to add substantive hours of service regulations, including maximum on-duty periods, minimum off-duty periods, and other limitations, for train employees (for example, locomotive engineers and conductors) providing commuter and intercity rail passenger transportation.<sup>95</sup> Such employees are limited to a maximum shift length of 12 consecutive hours (or 12 non-consecutive hours in the case of a split shift with a minimum 4 hour break) and minimum 8 hour break between shifts (10 hours if working a 12 hour shift). Additionally, there are further limitations imposed on consecutive shifts and the provision of minimum 'reset breaks'; employees must be afforded a maximum 13 of 14 consecutive days followed by 2 days off (one extra day may be worked if this facilitates return from away depot) and 24 hours off after 6 consecutive shifts if at least one of those shifts includes any night work.

The regulations also require additional recordkeeping requirements (including reporting of excess service hours) for relevant train employees and that railroads employing such workers analyse and mitigate the risks for fatigue in the schedules, and that the railroads submit for approval the relevant schedules and fatigue mitigation plans. For night work (work between 8pm and 4am), railroads should analyse their schedules using a validated and calibrated bio-mathematical model.<sup>96</sup>

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<sup>93</sup> Federal Railroad Administration (2009). *Federal Railroad Administration Overview, Highlights and Summary of the Rail Safety Improvement Act of 2008 (the Act)*. US Department of Transportation Federal Railroad Administration, Washington, available at <http://www.fra.dot.gov/downloads/RSIA%20Overview%20031009.pdf>.

<sup>94</sup> Federal Railroad Administration (2008). *Public Law 110-432-Oct 16, 2008: Federal Rail Safety Improvements*. US Department of Transportation, Washington, available at <http://www.fra.dot.gov/downloads/Pub.%20L.%20No.%20110-432%20in%20pdf.pdf>.

<sup>95</sup> Federal Railroad Administration (2011). *Hours of Service of Railroad Employees; Substantive Regulations for Train Employees Providing Commuter and Intercity Rail Passenger Transportation; Conforming Amendments to Recordkeeping Requirements*. US Department of Transportation, Washington, available at [http://www.orc-dc.com/files/2011/4071/fra\\_hos\\_2011\\_20290\\_pdf\\_90608.pdf](http://www.orc-dc.com/files/2011/4071/fra_hos_2011_20290_pdf_90608.pdf).

<sup>96</sup> Federal Railroad Administration (2010). *Procedures for Validation and Calibration of Human Fatigue Models: The Fatigue Audit InterDyne Tool*. US Department of Transportation Federal Railroad Administration, Washington, available at [http://www.fra.dot.gov/rpd/downloads/TR\\_Procedures\\_or\\_Validation\\_and\\_Calibration\\_final.pdf](http://www.fra.dot.gov/rpd/downloads/TR_Procedures_or_Validation_and_Calibration_final.pdf). This report presents the results of a study that illustrates a procedure for validating and calibrating a biomathematical fatigue prediction model for evaluating work schedules.

## 2. United Kingdom

The United Kingdom also adopts a largely process and procedure based approach to fatigue management. Before 2006, there were no specific controls on rail worker fatigue in the United Kingdom except via the *Rail (Safety Critical Work) Regulations 1994*, which required that 'safety critical workers' do not work hours that would be likely to cause them fatigue. Overall weekly working hours were restricted by the United Kingdom *Working Time (Amendment) Regulations 2003* (developed to bring the United Kingdom into the scope of the European Working Time Directive) to 48 hours for all workers, except where agreement is reached for longer hours. Night work is generally restricted to an average of eight hours.

In October 2006, the *Railways and Other Guided Transport Systems (Safety) Regulations 2006* came into force. Regulation 25 specifically addresses fatigue management and states:<sup>97</sup>

*(1) Every controller of safety critical work shall have in place arrangements to ensure, so far as is reasonably practicable, that a safety critical worker under his management, supervision or control does not carry out safety critical work in circumstances where he is so fatigued or where he would be liable to become so fatigued that his health or safety or the health or safety of other persons on a transport system could be significantly affected.*

*(2) The arrangements in paragraph (1) shall be reviewed by the controller of safety critical work where he has reason to doubt the effectiveness of those arrangements.*

Also in 2006, the United Kingdom Office of Rail Regulation published health and safety guidance on managing fatigue in safety critical work to support the new requirement in Regulation 25. The guidance, which was prepared by the Health and Safety Executive during the development of the *Railways and Other Guided Transport Systems (Safety) Regulations 2006*, and widely consulted upon, is aimed at those who have control of safety critical work on a transport system. It describes a series of stages that a controller of safety critical work should follow, based on good practice in managing fatigue risks.

The following stages are explored in significant detail to assist controllers of safety critical work to effectively manage the risks arising from fatigue in workers.<sup>98</sup>

- Identifying those safety critical workers affected.
- Setting standards and designing working patterns. This may include limits on hours worked and work patterns for safety critical workers, incorporating maximum shift lengths, minimum rest intervals, consecutive day shifts, consecutive night and early morning shifts, and maximum time periods between in-shift breaks (for example, meal breaks).
- Limiting exceedances.
- Consulting with safety critical workers.
- Recording the arrangements.
- Providing information to safety critical workers.
- Monitoring, to assess how effectively they are controlling the risks arising from fatigue and how the actual hours worked (including planned or unplanned overtime) compare with the specified limits and standards.

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<sup>97</sup> Queen's Printer of Acts of Parliament (2006). *The Railways and Other Guided Transport Systems (Safety) Regulations 2006*, available at <http://www.opsi.gov.uk/si/si2006/20060599.htm#25>.

<sup>98</sup> Office of Rail Regulation (2006). *Managing Fatigue in Safety Critical Work: Railways and Other Guided Transport Systems (Safety) Regulations 2006*. Office of Rail Regulation, London, available at <http://www.rail-reg.gov.uk/upload/pdf/293.pdf>.

- Taking action when safety critical workers are fatigued.
- Reviewing the arrangements.

With regard to duty hour limitations, the guidance document does suggest, however, that fatigue management controls should be reviewed under a number of situations, including when:

- shifts exceed 12 hours
- split shifts exceed 12 hours (including the break between shifts)
- more than four consecutive night shifts or very early shifts are worked in a rotating shift pattern
- more than six consecutive night shifts or very early shifts are worked in a permanent shift pattern
- more than 12 consecutive day shifts are worked
- only one day of rest is planned after any night shifts or very early shifts
- 72 or more hours of work (planned or unplanned) are accumulated in a working week
- more than 240 hours of work (planned or unplanned) are accumulated over a 28 day period.

In a presentation released in 2006, the Office of Rail Regulation stated that it saw these reforms as “moving the UK rail industry beyond compliance to better fatigue management”.<sup>99</sup>

In January 2012, the Office of Rail Regulation released additional guidance to support and update the requirements of the *Railways and Other Guided Transport Systems (Safety) Regulations 2006*.<sup>100</sup> The guidance is aimed at companies and individuals who have responsibility for managing fatigue in railway staff; although the Regulation 25 requirements apply to safety critical work, many of the principles and controls are broadly applicable to a range of railway staff. The guidance gives advice on good practice in managing fatigue associated with work in the rail industry and practical advice on development of fatigue risk management systems, rostering practices and risk management controls.

### 3. European Union

Regulation of fatigue management in the European Union, including the United Kingdom, focuses entirely on prescriptive hour restrictions and does not incorporate a requirement for operator fatigue management plans. The European Commission European Working Time Directive, from 1 August 2003, covers all workers (including rail workers) entitling them to the following hours of work:

- a weekly working time limit that must not exceed 48 hours on average
- a minimum rest period of 11 consecutive hours in every 24 hours
- a rest break during work time for shifts longer than 6 hours
- an uninterrupted 24 hour rest period for each 7 day period (added to the 11 hours' daily rest)

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<sup>99</sup> Lucas D (2006). *Moving the UK rail industry beyond compliance to better fatigue management*. Presented at the Royal Aeronautical Society seminar, 11 May 2006, available at <http://www.raes-hfg.com/reports/11may06-hfrisk/11may06-Lucas.pdf>.

<sup>100</sup> Office of Rail Regulation (2012). *Managing Rail Staff Fatigue*. Office of Rail Regulation, London, available at [http://www.rail-reg.gov.uk/upload/pdf/managing\\_rail\\_fatigue.pdf](http://www.rail-reg.gov.uk/upload/pdf/managing_rail_fatigue.pdf).

- a limit on night work in which average working hours must not exceed 8 hours on average per 24 hour period; (it has been noted that this permits 12 hour night shifts since 4 such shifts 'fit' into the 48 hour week)<sup>101</sup>
- a limit of 8 hours per 24 hour period in which night workers can perform heavy or dangerous work
- 4 weeks paid annual leave
- the right to free health assessments for night workers.<sup>102</sup>

European workers can choose to work longer than the average 48 hours per week but cannot be compelled by their employers to do so. Some rail workers (whose activities are intermittent, who spend their working time on board trains and whose activities are linked to transport timetables and to ensuring the continuity and regularity of traffic) are not covered by the night work limits and rest entitlements, but these workers are entitled to an equivalent period of compensatory rest at a different time wherever possible.<sup>103</sup>

It should be noted that this directive covers all manner of industry, without reference to fatigue as a particular safety risk.

In 2005, European Union Council Directive 2005/47/EC was introduced outlining working time limitations specific to the European Union rail network. Under this directive, rail workers are entitled to:

- a daily rest period of 12 consecutive hours and breaks of between 30 and 45 minutes
- a limit on driving time to 9 hours for day shifts and 8 hours for night shifts.

The directive also increases operator flexibility by allowing them to shorten daily rest periods from 11 hours (as required under the Working Hours Directive) to 9 hours in exceptional circumstances.

Additionally, further requirements apply specifically for mobile railway workers assigned to cross-border services.<sup>104</sup> Such workers are entitled to:

- A maximum 9 hours driving time for a day shift and 8 hours for a night shift between two daily rest periods.
- Maximum driving time over a two-week period limited to 80 hours.
- A daily rest period at home of 12 consecutive hours (9 hours permitted once a week In which case, the difference between the reduced rest and 12 hours will be added to the next daily rest at home).
- A daily rest period away from home of eight hours (a daily rest away from home has to be followed by a daily rest at home).

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<sup>101</sup> Akerstedt T and Kecklund G (2005). *The future of work hours – the European View*. Industrial Health, 43: 80-84.

<sup>102</sup> European Commission Employment, Social Affairs and Equal Opportunities. *Working Conditions – Working Time Directive*. European Commission, Brussels, available at <http://ec.europa.eu/social/main.jsp?catId=706&langId=en&intPagId=205>.

<sup>103</sup> EUR-Lex: Access to European Union Law (2003). *Directive 2003/88/EC of the European Parliament and of the Council of 4 November 2003 concerning certain aspects of the organization of working time*. Official Journal of the European Union L 299/9–L 299/19, available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:299:0009:0019:en:PDF>.

<sup>104</sup> Applicable to any worker who is a member of a train crew assigned to interoperable cross-border services for more than one hour on a daily shift basis.

- Break requirements for a single driver (no mandatory break requirements if two drivers) of 45 minutes if shift is over 8 hours, or 30 minutes if shift is between 6 and 8 hours (part of the break to be given between the third and sixth hour).
- Non-train driver staff entitled to a break of at least 30 minutes if shift longer than 6 hours.
- Weekly rest period of 24 hours plus daily 12 hour rest requirement.
- Yearly requirement for 104 rest periods of 24 hours including at least 12 weekends and 12 two-day non-weekend rest breaks per year.

#### 4. Canada

Canada adopts a similar approach to the United States, incorporating both mandatory duty time limitations and a requirement for operator fatigue management plans. In June 2005, the Canadian Government approved amended *Work/Rest Rules for Railway Operating Employees* developed by the Railway Association of Canada governing the hours of service and fatigue management for rail workers.<sup>105</sup>

Covering a wide range of rail safety workers, the Canadian Work/Rest Rules contain detailed provisions for minimum requirements with respect to maximum duty times and mandatory off-duty times.<sup>106</sup> These restrictions include:

- maximum shift of 12 hours (extended to 16 hours for work train service);
- maximum combined duty times of 18 hours for multiple tours of duty, between “resets” (that is, break periods of 6 or 8 continuous hours off duty, depending on whether the worker is at the “home terminal” or elsewhere); and
- minimum off-duty break times of 8 or 6 continuous hours (depending on location) following on-duty periods of greater than 10 hours.

The rules also include the requirement for rail operators to develop fatigue management plans. Fatigue management plans must consider, but not be restricted to, employee work scheduling practices; education and training; on-the-job alertness strategies; rest environment; work environments; working under unusual operating conditions; and unique deadheading circumstances.<sup>107</sup>

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<sup>105</sup> Transport Canada. *Work/rest rules for railway operating employees*. Transport Canada, Ottawa, available at <http://www.tc.gc.ca/eng/railsafety/rules-tco140-364.htm>.

<sup>106</sup> The Work/Rest Rules apply to “operating employees”. An operating employee is defined as “a locomotive engineer, conductor, trainman, yardman, pilot, operator of remote control locomotives and operator of light rail passenger equipment, as well as any person whose preponderance of time is spent in such classifications, working in any class of service who is physically involved in the operation or switching of trains, engines, and equipment. Any other person who performs the duties of an operating employee is deemed to be an operating employee while those duties are being performed.”

<sup>107</sup> Transport Canada. *Work/rest rules for railway operating employees*. Transport Canada, Ottawa, available at <http://www.tc.gc.ca/eng/railsafety/rules-tco140-364.htm>.

## Appendix F: Fatigue Academic Working Group evidence base

In late 2010 an Expert Panel, comprising policy, academic and industry representatives, was established by the Australian Transport Council (ATC) to consider whether the Rail Safety National Law (the National Law) should specify maximum hours of work and/or minimum periods of rest and to which rail safety workers such limits should apply to (amongst other matters).

The Expert Panel noted that the risk management process taking into account those factors already agreed (refer to *Section 3. Existing provisions for fatigue risk management in the National Law*) should result in a set of rostering hours that manages fatigue-related risks so far as is reasonably practicable. However, the Expert Panel also recognised that this approach could be open to exploitation, and recommended a hybrid approach, allowing the risk management process to operate within boundaries.

A single set of hours or boundaries for all rail safety workers was not supported by the Expert Panel on the basis that a 'one-size-fits-all' approach would not be suitable across the entire rail sector.<sup>108</sup> Instead, the Expert Panel proposed a tiered approach to the management of fatigue-related risks, with more flexible hours available to those rail operators who can demonstrate the maturity to manage and control fatigue risks to an acceptable level.

The first tier was referred to as 'standard hours'. Working under the standard hours requires an operator to still include all the minimum standards for fatigue risk management programs, and it was envisioned that the majority of operations would function within standard hours.

The Expert Panel also proposed second and third tiers for those operators requiring longer hours or greater flexibility in working time arrangements. It was proposed that operators that want to work under these 'non-standard hours' would be required to provide evidence to the Regulator about how they propose to control any increase in fatigue-related risk attributable to the non-standard working time arrangement. These operators would need to demonstrate that the additional controls they put in place would produce the same or a lower level of risk than is associated with 'standard hours'.

In this way, operators who have the necessary safety infrastructure and maturity to implement safe systems of work would be able to access more flexible approaches for working hours. Most importantly, the Expert Panel recommended the establishment of a 'safety net', hours of work or rest that operators could not roster beyond.

The Expert Panel's report was endorsed by ATC in May 2011 on the basis that the specific boundaries (the specific hours of work or rest that constitute the 'safety net') indicatively provided for in the report be developed.<sup>109</sup>

In line with the Expert Panel's decision to base the framework on purely safety, rather than industrial or other concerns, the National Transport Commission (NTC) established the Fatigue Academic Working Group, a panel of four academic experts in the area of fatigue management – Professor Drew Dawson, Associate Professor Shantha Rajaratnam, Professor Ann Williamson and Associate Professor Sally Ferguson. This group was tasked with the population of the Expert Panel framework and definition of the specific hours of work and rest.

The chosen duty time limitations were developed on the basis of current scientific knowledge in the fatigue domain and expert advice, drawing on necessary additional relevant research as required.

*Option 4 – Risk-based approach to limiting hours of work and rest with consequence-based categorisation of rail safety workers* represents the regulatory option based on the Fatigue

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<sup>108</sup> Represents the views of the majority of members; agreement amongst the panel members was not unanimous.

<sup>109</sup> The Expert Panel report is available at <http://www.nrsrproject.sa.gov.au/publications>.



Academic Working Group advice. The detailed scientific rationale underpinning this option is provided in this appendix.

*Option 3 – Simplified risk-based approach to limiting hours of work and rest* is also based on advice provided by the Fatigue Academic Working Group, albeit with modifications to simplify the regulatory framework.

## 1. Rest break-focussed dimensions

Rather than basing the dimensions on maximum work hours, as provided for indicatively in the Expert Panel report, the Fatigue Academic Working Group proposed a rest break-focussed approach in a move believed to be towards best-practice management of fatigue. This approach, while effectively achieving the same outcome in limiting working hours, addresses the primary causes of fatigue (lack of restorative rest), with the focus being on the provision of the opportunity for rest rather than on hours of work.

The recommended rest break principles are consistent with those currently in use in the heavy vehicle industry; although it should be noted there are differences in the minimum rest break periods. This reflects the wider range of workers being covered in the rail industry (i.e. all rail safety workers as opposed to simply drivers), the diverse nature of the tasks being undertaken and differing consequences of a fatigue-related error.

The approach of providing adequate sleep opportunity is also directly consistent with recent developments in safety science, particularly a model referred to as the 'defences-in-depth' model of fatigue risk management (Dawson and McCulloch, 2005), which is referenced in the Expert Panel report. Based on the work of Reason (1997) this model refers to controls related to regulation of sleep opportunity as Level 1 controls, reducing the likelihood of fatigue-related errors by reducing the likelihood of fatigue.

Key design principles developed by the Fatigue Academic Working Group focus on:

- minimum sleep periods, opportunity for sleep and time of day influences
- the cumulative nature of fatigue and sleep loss
- fatigue risk associated with night work
- duration of working time
- the role of short breaks.

The focus has therefore been on creating the opportunity for rest and sleep, shifting the emphasis for fatigue management to management practices and control over fatigue precursors.

## 2. Proposed values

As indicated in the Expert Panel's report, the Fatigue Academic Working Group noted that it is important to note that any chosen dimensions in the model will interact and cannot be assessed in isolation from the other dimensions and risk factors. It is the interaction of the dimensions that will determine the likelihood that an individual will experience work-related fatigue.

The risk, however, is also determined by the consequence of a fatigue-related error and is linked to the nature of the task undertaken at any given level of fatigue. Some tasks carry greater consequences than others, and therefore produce greater risks for a given level of fatigue. As such, the Expert Panel recommended that different sets of limits are applicable to the differing risk 'consequences'.



The consequence categorisation is provided in *Figure 4* and limits are provided in *Table 4* and *Table 5*.<sup>110</sup> The full framework is presented under *Option 4 – Risk-based approach to limiting hours of work and rest with consequence-based categorisation of rail safety workers*.

### 3. Supporting explanation and rationale

The Fatigue Academic Working Group proposed that there are three key dimensions that define the level of risk associated with a 'pattern-of-work'. Each of these dimensions has been unpacked into its component elements. The first dimension is focused on intra-shift breaks; the second on inter-shift breaks and the third on inter-sequence breaks.

For the purposes of Options 3 and 4 the following definitions apply:

#### 3.1 Intra-shift-break

Intra-shift breaks are break periods in which an employee is provided respite from their work task. This break is sometime referred to as time-off-task as distinct from time-on-task. Such a break is at least 15 minutes in duration and typically permits an employee time to shift focus away from their primary task and recover from the physical or mental demands of the task. The breaks are used to divide up the shift into sustainable periods of time-on-task and time-off-task to ensure attention can be sustained at a safe level.

The table assesses the risk by determining the duration of frequency of intra-shift breaks and the subsequent effect on the timing and duration of 'time-on-task'. As the total amount of the intra-shift breaks increases and the maximum amount of time-on-task decreases so does the likelihood of a fatigue related error. By optimising the timing and duration of intra-shift breaks it is possible to minimise fatigue-related risk due to this factor.

The table provides guidance on the timing and amount of breaks in a pattern of work and can be used to risk assess the work practices. Where the time on-task is three hours or less and the breaks total greater than 13% of the shift there is no significant additional risk. As time-on-task increases and total break time decreases the risk increases. Where the time-on-task exceeds five hours or the total amount of time-off-task falls below 8% then this leads to an unsustainable situation in which it is difficult to maintain safe levels of performance. In between these values the risk increases.

It is important to note that intra-shift breaks do not typically provide a sleep opportunity although they can be used for napping if required. If an intra-shift break is used for napping the break should be at least 30 minutes in duration and should be consistent with standard napping guidelines.

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<sup>110</sup> The Expert Panel report recommended that the risk category be determined by the definitions contained in the guidelines to Australian Standard 4360: *Australian Standard (AS) 4360 Risk Management Guidelines*. It was noted, however, that the AS4360 Guidelines have been superseded and are not readily available at the time of policy development. As an alternative means of categorisation that met the same objective, it was proposed that an approach similar to that the risk categories of the *National Standard for Health Assessment of Rail Safety Workers* be adopted, with the necessary modifications to contextualise the assessment to a fatigue risk management circumstance. The *National Standard for Health Assessment of Rail Safety Workers* is mandated by the National Law under separate provisions relating to rail safety worker health and fitness. It is therefore already a widely used system of classification by industry, readily available, and should therefore pose a lesser burden to industry in implementation.

### 3.2 Inter-shift breaks

Inter-shift breaks are break periods between subsequent shifts and are typically shorter than 30 hours and provide only a single sleep opportunity. These breaks should provide employees with sufficient opportunity to be considered fit-for-duty for each shift across a sequence of shifts. There are three key determinants of whether inter-shift breaks are sufficient to achieve this.

#### ***Total sleep opportunity***

Total sleep opportunity is the total amount of time available as a sleep opportunity in a seven-day period. In general, it is known that people will typically allocate approximately half their time away from work to sleeping and about half to social, family and community activities. As such, where someone has at least 120 hours of time away from work over a seven day period it is likely that they will be able to allocate sufficient of this to sleeping in order to be well rested. As this amount decreases, it is known that this causes a tension between the need for sleep and social obligations such that people reduce their sleep and can become increasingly fatigued. Where opportunity for sleep falls below 84 hours over seven days it is known that this can produce a very significant reduction in the amount of sleep obtained. In between these values the risk increases.

#### ***Subsequent sleep opportunities***

In order to ensure that an employee is fit-for-duty it is important that they have had sufficient time prior to commencing work to obtain sufficient sleep to be able to work safely through their next shift. Moreover, they will need sufficient time off after their shift to recover from the shift and to prepare for the next shift in the sequence. To ensure that an employee has sufficient time to recover from the previous shift and prepare for the next they need, on average at least 12 hours off per day. Any reduction in the time off between shifts should be offset by an increased time off before or after that shift so as to enable them to balance their sleep and social needs appropriately. It is known that an individual can typically reduce social obligations in response to a single reduced sleep opportunity but that this cannot be permitted to accumulate over a sequence of shifts otherwise they will likely reduce their sleep to maintain their social obligations.

Adequate sleep opportunity can be achieved by ensuring that reductions in sleep opportunity between shifts are compensated by ensuring that sleep opportunities before or after are increased. In general, where the sleep opportunities before and after a work opportunity total at least 24 hours it should be possible to obtain sufficient sleep in order to work safely. If the total of any two sequential sleep opportunities falls below 22 hours, then it is likely that there will be insufficient time available to ensure adequate recovery. In between these values the risk increases.

#### ***Single sleep opportunity***

As indicated above, where a single sleep opportunity falls below 12 hours it is known that there is a tension between the need for sleep and the need to meet family and social obligations. It is also known that once a single sleep opportunity falls below 10 hours it is unlikely that an individual will be able to obtain sufficient sleep to work safely since the average sleep amount for a substantial proportion of the population will likely fall below 6 hours and a smaller but significant group will get less than 5 hours of sleep. As a consequence, the Fatigue Academic Working Group propose that risk will increase once a single sleep opportunity falls below 12 hours and should not be permitted below 10 hours. In between these values the risk increases.

### 3.3 Inter-sequence breaks

While it is theoretically possible to continue to work over extended numbers of shifts provided there is sufficient sleep opportunity between them, in practice this does not happen. There are strong cultural pressures (and some evidence for physiological factors) all of which together place a practical limit on the number of shifts people can work in a row before their performance starts to decline. Most people have significant social and community obligations that require them to engage in such activities during the day and to spend at least some of their time sleeping at night. This contributes to an employee's sense of social engagement and provides an opportunity to rest and recover at a deeper physiological and social level than is possible within a sequence of shifts separated by short breaks.

The time-of-day at which the sleep opportunity occurs also influences the amount of sleep obtained. This is due to the fact that humans are diurnal mammals and their physiology has evolved to be active and alert during the day (0600-2200) and inactive and sleepy during the night period (2200-0600). This effect is a physiological inevitability and the reductions in alertness associated with night work and day sleep cannot be overcome by experience or willpower despite anecdotal (and often self-serving) claims to the contrary.

It is known that in shift workers day sleep is typically shorter, more disrupted and less restorative than night sleep. It is also known that daytime sleep opportunities produce less sleep per hours than the sleep opportunities of similar duration at night. As a consequence, where sleep opportunities occur during the day they result in shorter, less restorative sleep and reduced alertness. Irrespective of the amount and quality of sleep obtained, night work also requires an employee to be awake at a time when physiological alertness is reduced.

As a consequence, work patterns that involve night work/day sleep produce less sleep and therefore fatigue increases more rapidly across a sequence of shifts due to greater sleep loss along with reduced alertness associated with working during the night. This increases the risk of fatigue and should be taken into account when determining the acceptability of a shift pattern. Where there is no night work or day sleep opportunities, then there is unlikely to be an increase in risk due to this factor.

In practice, such a break requires at least two sequential night's sleep (2200-0600) separated by a day off in between. This requires a minimum of a 32-hour break, but possibly more depending on the work pattern prior to and following the inter-sequence break. In most cases, a 32+ hour break provides sufficient opportunity to discharge any residual accumulation of fatigue across a sequence of shifts along with a day off work in order to discharge social and family obligations.

Not surprisingly, the frequency of inter-sequence or 'reset' breaks influences the rate at which performance is maintained over extended periods. The main influence on the number of shifts that can be worked in a row is the extent to which the employee is involved in night work. Where a sequence of shifts involve night work, the rate at which sleep debt, and social obligations accumulate is far greater. A long sequence of night work can physiologically increase fatigue due to sleep loss but the social isolation of night work can also increase social and family pressure and supplant sleep. As a consequence inter-sequence or 'reset' breaks need to occur more rapidly to prevent the over-accumulation of sleep and social debts.

Where the shift pattern involves work that occurs in the period 2200-0600, that is, late finishes, early starts and night shift, the interval between inter-sequence breaks should be less than for those where it does not. As can be seen from *Table 4*, as the sequence of shifts increases for work only during day times up to 5 shifts are not considered to significantly increase the risk. On the other hand, it is known that once the sequence is greater than 12 shifts in a row, the social and physiological effects can make it difficult to sustain safe performance beyond this point. In between these values the risk increases.

Since shift patterns that involve work during the period 2200-0600 have been shown to accumulate sleep and social debt more rapidly, the number of sequential shifts needs to be limited to prevent unsafe levels of fatigue. It is known that any shift that involves work in the period between 2200-0600 increases risk. It is also known that having to work more than seven such shifts in a row significantly increases the risk to a point most would consider unacceptable. In between these values the risk increases.

#### 4. Bio-mathematical approach

The Expert Panel report recognised that in recent years many rail transport operators in Australia and North America have opted to use software-based tools to provide an analysis and automated reporting of the fatigue-related risk associated with working time arrangements. The Expert Panel proposal suggested that a 'quantitative (bio-mathematical) approach' could be used as an alternative means of compliance (separate from those limits provided for by using *Table 4* and *Table 5*).

The Fatigue Academic Working Group was tasked to provide guidance on whether either approach should have primacy; namely, to articulate whether a bio-mathematical approach could operate in isolation or whether it should be further mitigated by the primary rule set.

The advice received indicated that the method of assessment of the type set out in *Table 4* and *Table 5* should retain primacy and that, while bio-mathematical models have significant potential to assist operators and the Regulator to analyse and understand patterns of work, at this stage they still lack a sufficient body of scientific evidence to be used independently.

This said, operators might use a bio-mathematical model to undertake their assessment of the likelihood that a rail safety worker may be exposed to fatigue-related risk. In doing this the operator will need to demonstrate to the Regulator how they are using the model and how they are meeting the same safety outcome.

It is envisioned that a guideline will be developed to assist operators to understand the appropriate use of bio-mathematical models. Such guidance will assist operators in complying with the National Law provisions and provide practical information to inform operators of the Regulator's expectations.

Internal procedures will be developed to assist regulatory staff in assessing the use of bio-mathematical models as a tool within an operator's fatigue risk management program.

As such the 'quantitative (bio-mathematical) approach' has not been included in the regulatory options examined in the draft regulatory impact statement.

# Appendix G: Economic assessment – social cost-benefit analysis





# **Economic assessment of options for the further regulation of hours of work and rest of rail safety workers**

**DRAFT REPORT PREPARED FOR THE NTC**

February 2012





# Economic assessment of options for the further regulation of hours of work and rest of rail safety workers

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# Economic assessment of options for the further regulation of hours of work and rest of rail safety workers

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## Executive summary

In November 2011, transport ministers approved a National Rail Safety Law (“National Law”). Though the National Law was approved in November 2011 on the basis of a regulatory impact statement, the question of what further regulatory arrangements should apply to hours of work and rest for rail safety was left in abeyance. Four different options have been developed for consideration:

- Option 1: There are no prescribed hours of work and rest.
- Option 2: Prescribed hours of rest for train drivers applicable in New South Wales are extended to other jurisdictions.
- Option 3 - A simplified risk-based approach to setting hours of work and rest is implemented.
- Option 4 - A risk-based approach predicated on a risk-based categorisation of rail safety workers is implemented.

This report presents an economic assessment, based on a social cost-benefit analysis, of these options, *in the context of the implementation of the National Law*. This context means that the baseline counterfactual, against which these options are assessed, is one in which:

- a single national rail safety regulator has been established;
- section 29 of the National Rail Safety Regulations governing fatigue risk management programmes is implemented; and
- state-based variations on the further regulation of hours of work and safety and rest continue to exist.

Importantly, the cost-benefit analysis is not a before/ after test, but a comparison of the future in which one of the options considered has been implemented, versus a future in which the baseline applies.

The main categories of regulatory impact which determine the outcome of the cost-benefit analysis are:

- The impacts of the different policy options on risks associated with fatigue-related accidents and incidents.
- Operators’ administrative compliance cost.
- Costs of achieving compliant rosters.
- Regulators’ administrative costs.
- Costs savings and efficiency associated with regulatory harmonisation (where applicable).

Information and data regarding these impact categories were sought from stakeholders through a consultative process organised by the National Transport Commission.

It is unlikely that differences between the options will lead to differences in risks associated with fatigue-related accidents and incidents, *relative to the baseline*, for several reasons. First it is difficult to establish a causal link between fatigue and rail-accident incidents, in isolation for other safety and non-safety factors. Second, establishing a causal connection between changes in practices (that result from changes in the form of regulation) to changes in risk is even more difficult.

These difficulties are exacerbated by the fact that for many operators, enterprise bargaining agreements are usually more constraining than the regulations themselves, and that it is impractical to consider fatigue management in isolation from safety management generally. The latter point means that a change in practice that might improve fatigue outcomes may have offsetting impacts on other aspects of safety management (for example, a shift from day to night shifts for track workers can improve fatigue outcomes, but can also increase their exposure to other hazards).

Given these difficulties it is unsurprising that there was also no evidence to suggest that differences in the form of regulation (specifically, between less and more prescriptive approaches) had an impact on fatigue-related risks. Indeed, the main difference between less and more prescriptive approaches is that, in theory, the latter are likely to impose higher costs, since they are more likely to allocate responsibility for risk to regulators, who are typically less well able to manage these risks.

For these reasons, the analysis set aside the question of how the options would impact on fatigue-related risks relative to the baseline counterfactual, and focused on the other impact categories. These are essentially cost categories associated with the implementation of the regulatory options.

The limited extent and robustness of quantitative data gathered through the consultative process precluded a calculation of the net benefits of each of these options relative to the baseline. However, such quantitative data as were provided, along with qualitative feedback and commentary, enabled a ranking of the options.

It was established that Option 1 represented the preferred approach. It is not expected to result in material costs relative to the baseline; indeed, it could generate some benefits. In particular, relative to the counterfactual;

- It reduces administrative compliance costs, mainly for operators. This cost reduction is essentially a reflection of harmonisation benefits.
- It has, potentially at least, the benefit of promoting economic efficiency, particularly in relation to cross-border and multi-jurisdictional operations.



By contrast, it is unlikely that any of the other options presented would be preferable to the counterfactual. This is primarily because of the compliance costs that they impose – especially in terms of operational efficiencies – relative to the counterfactual.

Option 4 was considered to be the second-ranked approach, albeit behind the counterfactual, though the costs associated with this are expected to be significantly higher than those in Option 1. This is mainly on account of administrative compliance costs for operators and costs to operators associated with constraints on rostering. Option 2 is expected to be significantly more costly than Option 4. While Option 3 was assigned the lowest ranking, primarily because it most expands the scope of prescription to cover intra-shift breaks.

That Option 1 represents the preferred approach makes intuitive sense. Regulation and fatigue management operate in a situation where information is asymmetric (in particular, operators know more about their processes than regulators) and incomplete (neither regulator nor operator can predict factors that affect rail operations, such as market demand, weather conditions, deficiencies in infrastructure, and so forth that also have a bearing on fatigue). In such circumstances, and taking into account the widely differing characteristics of operators, prescriptive approaches to regulation will impose more costs, particularly in terms of imposing inefficient constraints on operators' rostering. The superiority of Option 1 is largely a reflection of the fact that it is less prescriptive than the other approaches, and is more consistent with the co-regulatory approach to rail safety risk that was developed precisely on account of the informational constraints that affect safety regulation in the context of the Australian rail industry.

An alternative way of presenting this issue is that Option 1 (and to a lesser extent the counterfactual and Option 2) is better at providing regulators with the *option* of adjusting requirements and improving practices in light of new information and innovation. These include, for example, new research into the science of fatigue management or new developments in technology that can help manage fatigue. By contrast, more prescriptive approaches are not as good in taking into account the “option value” associated with new developments.

Because Option 1 imposes lower costs – particularly in terms of administrative costs and the costs of achieving compliant rosters – harmonisation based on this option is more likely to promote economic efficiency through service expansion and increased competition. Even if the initial impact on competition is marginal, a lower cost form of harmonisation will be more conducive to the development of competition in the future.



# 1 Introduction

## 1.1 Background and context

In December 2009, the Council of Australian Governments (COAG) agreed to create a single national rail safety regulator to administer the National Rail Safety Law (“National Law”).

The National Law was approved by transport ministers in November 2011 and its impact was assessed as part of a previous Regulatory Impact Statement (RIS).<sup>111</sup> However, the issue of whether the National Law should further regulate (by introducing a ‘safety net’ for) hours of work and rest for rail safety workers remained outstanding.

- support a seamless national rail transport system;
- not reduce existing levels of rail safety;
- streamline regulatory arrangements and reduce the compliance burden for business; and
- improve national productivity and reduce transport costs generally.

## 1.2 Objectives of this report

This report presents an economic assessment, in the form of a social cost-benefit analysis, of options that have been proposed for further regulating hours of work and rest for rail safety workers under the National Law. This economic assessment builds upon the previous RIS by considering four different policy options which have been evaluated relative to a counterfactual baseline.

The baseline scenario assumes that the National Law and associated National Rail Safety Regulations (“National Regulations”) have been implemented, including section 29 of the National Regulations that deals with fatigue-risk management. It also assumes the establishment of the National Rail Safety Regulator and the implementation of a national accreditation scheme. Finally, it assumes the continuation of any existing state-based variations in the way in which hours of work and rest are further regulated.

The options under consideration relate to whether or not there should be a ‘safety net’ (around hours of work and rest) that supplements the National Regulations; and what form this safety net should take. In particular, the four options are that:

- There are no prescribed hours of work and rest.

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<sup>111</sup> National Transport Commission (2011), *Rail Safety National Law: Draft Regulatory Impact Statement*

- Prescribed hours of rest for train drivers applicable in New South Wales (NSW) are extended to other jurisdictions.
- A simplified risk-based approach to setting hours of work and rest is implemented.
- A risk-based approach predicated on a risk-based categorisation of rail safety workers is implemented.

The counterfactual baseline and the four options are explained in greater detail in sections 2.1 and 3.2, respectively, of this report.

### 1.3 Approach

The approach taken in this report is consistent with the requirements set out under the COAG guide to best practice regulation, and more specifically the guidelines set out for cost-benefit analysis.<sup>112</sup>

Under these requirements, a necessary starting point for the cost-benefit analysis is to identify the underlying problem that the proposed regulatory options seek to address, and the constraints that affect their implementation.

In this case even in the absence of *any* regulation, operators would, to some extent, seek to manage fatigue-related safety risks. A key issue is the extent to which operators internalise the full costs to society in managing fatigue risk. The extent to which they do will determine the extent of market failure and thus the potential scope for regulatory action.

Where there is market failure, regulation may be an appropriate option, provided the costs of regulation do not outweigh the benefits that are brought about by addressing the source of market failure. Risk mitigation is never costless: there will be costs borne by operators implementing fatigue-management measures, and costs to regulatory authorities. This is why the constraints that affect the implementation of a particular regulatory option need to be taken into account. We consider in greater detail the issue of market failure and the extent to which specific regulation relating to hours of rest and work can play a mitigating role in section 2.1 of this report.

In the context of this analysis, it is also important to emphasise that what we seek to measure is not the impact of regulatory options versus no regulation at all. Rather, it is the impact of certain regulatory options versus a baseline in which specific regulation exists which requires operators to specify safe hours of safety and rest, and more specifically a mandatory requirement for a fatigue-risk management programme as an element of the safety management system (in

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<sup>112</sup> Council of Australian Governments (2007), Best Practice Regulation – A Guide for Ministerial Councils and National Standard Setting Bodies, in particular pp 21-26.

addition to other regulations and arrangements, such as liability laws and insurance arrangements, that may cause operators to internalise the wider social costs of fatigue related risk).

A challenge for this assessment is that there is no quantifiable evidence linking *changes* to the regulation of hours and work and rest with risk-reduction benefits. This in turn underlines the importance of costs associated with the implementation of different regulatory options.

The preparation of this report has run in parallel to a data-gathering exercise involving stakeholders. The analysis in this report uses information provided by stakeholders as at 10 January 2012.

Not all the issues that are relevant to the cost-benefit analysis can be addressed through data received from stakeholders. This is particularly true of competition benefits that may result from a standardisation of regulatory approaches, and from wider economic benefits that reflect the possible reduction of certain externalities (for example, reduced social costs of road pollution associated with any shift from road to rail transport as a consequence of greater efficiencies/competition in the latter). For these costs, external data (where available) have been relied on.

## 1.4 Structure of this report

This report is structured as follows:

- Section 2 provides an overview of the issues to be considered and economic concepts underlying the assessment.
- Section 3 describes the regulatory options assessed and the baseline against which the impacts have been derived.
- Section 4 explains the main types of cost and benefits that have been considered.
- Section 5 provides an explanation of how the costs and benefits highlighted in section 4 relate to each of the four regulatory options under consideration. It provides a ranking of the options under consideration and the baseline counterfactual.



## 2 Regulation and the management of fatigue related risks

In this section we provide an overview of the issues and economic concepts underlying the regulation and management of fatigue-related risk and their relevance to this assessment.

### 2.1 Costs associated with fatigue risks in rail

Fatigue has been identified as a contributing factor in accidents and incidents in railway systems, though it is difficult to quantify the extent to which fatigue is a causal factor in most incidents. Data for the United States from the Federal Railroad Administration's accident and incident database suggest that fatigue was the primary cause of 0.1% of railway incidents in the US<sup>113</sup>. However, human factors more generally were the primary cause in 34% of incidents and it is likely that fatigue may have been a contributing factor in a certain proportion of these.<sup>114</sup>

There is a much lower incidence of accidents involving freight trains than road freight, although the costs involved in individual incidents can be large. The Bureau of Infrastructure, Transport and Regional Economics (BITRE) 'conservatively' estimated the cost of all rail accidents (excluding apparent suicides and collisions with road vehicles) that occurred in Australia in 1999 to be \$194 million. The bulk of these involved passenger trains<sup>115</sup>.

The costs that result from accidents and incidents in the railway system are, broadly:

- Costs to workers and their families associated with death or rehabilitation and care in the case of an accident.
- Cost on operators associated with any losses of capital stock; lost man hours or lost productivity.
- Indirect costs on operators associated with lost passenger or customer confidence in the reliability of the railways and hence reduced volume and revenues.
- Cost on customers/passengers associated with any resulting delays, lost freight or passenger death and injury.

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<sup>113</sup> FRA incident and accident data by primary cause for the period January 1991 to September 2011

<sup>114</sup> *ibid*

<sup>115</sup> BITRE estimated this figure to be \$133 million in 1999 prices. This has been indexed up to September 2011 price using CPI (source: BITRE (2003) "Rail accident costs in Australia", Report 108 (<http://www.bitre.gov.au/publications/60/Files/r108.pdf>))



- Cost for society more broadly from environmental damages and clean-up, and death and injury of members of the public.

Some of the costs described above are borne directly by the operator, and some are borne by other parties. Operators certainly face private exposure costs which stem from rail accidents and incidents. The issue is, that in managing these risks, they may not take into account (“internalise”) the costs that are borne by society as a whole that arise from these risks. By extension, they may not take into account the benefits that arise to society through a reduction in risks (i.e. the avoided social costs of accidents and incidents). Where there are discrepancies between private and social costs (and consequently, between the private returns to fatigue management and social risks), market failure is said to occur.

It is the extent to which they take into account all costs that will determine the extent of market failure and thus the potential scope for regulatory action.

## 2.2 Market failures in fatigue risk management

If operators bear all the costs associated with fatigue (including accidents and incidents caused by fatigue), it is more likely they would invest in the socially-optimal level of fatigue management effort. They may do so on account of a number of factors. The first of these is market mechanisms; specifically labour markets and markets for the transport of passengers and merchandise. For example, injuries to personnel can have consequences on productivity and output. A reduction in reliability and safety affecting passengers and merchandise can cause a switch to alternative modes of transport.

The incentives that operators have to manage labour-related costs can be reinforced through bargaining agreements. Stakeholder responses suggested that enterprise bargaining agreements (EBAs) embodied safety standards – including those related to fatigue risks – that often exceeded the requirements of the law.

A second mechanism is the cost to operators of liability under legal arrangements (for example, regulating damages to the environment or to public health and safety) and the insurance costs associated with these.

Some research has suggested that “in practice, compensation of those affected by incidents may not be equal to the full societal cost of the impact”<sup>116</sup>. If this is true, the costs of an incident will not be fully internalised by the industry. Unfortunately, there is very little evidence in respect to this issue. For its part, the Productivity Commission found that there is significant internalisation of rail

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<sup>116</sup> David Bray (2005), Risk tolerability in rail safety regulation, Report prepared for the National Transport Commission, Melbourne, p 18

externalities (including accident costs) through legal liability and various other means<sup>117</sup>.

Certainly, operators are aware that they may bear some of the broader social costs associated with any incidents. This is evidenced by the fact that they take out liability insurance to limit the extent of their outlay for an ‘at fault’ accident. BITRE (1999b) estimated that half the rail freight accident cost was met through insurance (though this finding sets aside the issue of whether operators are engaging in substantial self insurance).

Putting the data to one side, economic theory suggests there are a number of factors that could lead operators not to engage in the optimal level of fatigue-risk management.

One factor is that operators may not correctly assess accident and incident risk. This phenomenon has been documented in the case of events –in the transport sector but also in many others - that are low in frequency but high in consequence. This problem may be aggravated by information asymmetries between operators and insurers. For example, monitoring operators’ accident mitigation efforts is costly, and this may lead to imperfect monitoring by insurers. In such circumstances, operators will face weaker incentives to undertake preventive efforts that are of net benefit (in terms of avoided future accident costs). This is because the negative consequences would be borne by the insurer, who would have been unable to monitor preventive efforts and reduce accident pay-outs in the event of “insufficient effort”.<sup>118</sup> This is more likely to be the case with less experienced operators and/or operators that are financially viable at the margin.

Secondly, there is the potential for information asymmetries between operators and the broader public. As the data referred to in section 2.1 suggest, it is difficult to pinpoint fatigue as the primary cause of any accident or incident. Instead it is more likely to be one of a myriad of factors which contribute to an incident. This makes it less likely that an operator would be deemed responsible for any incident, which in turn may reduce the likelihood of successful litigation. The Independent Transport Safety Regulator, NSW (ITSR) has commented that it is not aware of any operators that have a systematic approach to investigating fatigue factors in incidents. They consider that this prevents the real costs of fatigue being assessed.

Finally, there is a lack of certainty around the links between fatigue levels and the likelihood of accidents/incidents and how fatigue can best be mitigated. This makes it difficult for an individual operator to quantify the risk and hence determine the form and extent of fatigue management measures that should be

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<sup>117</sup> Productivity Commission (2006), Road and Rail Freight Infrastructure Pricing, Inquiry Report

<sup>118</sup> Ian Savage (1998), ‘The economics of railroad safety’, Transportation research, economics and policy, Volume 7, Kluwer Academic

put in place. It is possible that these risks and mitigation measures may be more visible at the aggregate industry level. Many operators raised the fact that safety benefits were difficult to quantify. ITSR has noted that in the absence of data on the link between fatigue and accidents there may be pressure to lower standards due to commercial or service-delivery pressures. In general, ITSR considers that operators are overly optimistic about the effectiveness of risk controls.

## 2.3 Factors affecting the costs of regulation

As observed in section 1.3, risk mitigation is not costless, and neither is the regulation of risk mitigation. It is imperative to emphasise a few factors relating to the economics of regulation and its costs that are of importance to this analysis.

The first of these is that, just as informational issues drive market failure (see section 2.2), they also constrain the effectiveness of regulation. The main issues are asymmetric information and incomplete information.

By “asymmetric information” we mean that the regulator will have less information about the operator’s actions and behaviour than the operator. The regulator may therefore attempt to overcome this by extracting more information from the operator. This will increase the compliance costs for operators and administrative costs for regulators. There will also be asymmetric information between the fatigue management staff of operators and its workers – the latter will usually have a better understanding of whether they are fatigued, and/ or of whether they have engaged in conduct that increases or reduces fatigue. This increases the verification costs to the operator associated with fatigue management.

By “incomplete information” we mean that neither operators nor regulators can predict future contingencies with certainty. Such future contingencies include such things as fluctuations in market demand (especially for commodities such as grain), changes in weather conditions, or changes to the quality of infrastructure. This has the result that planned operations may change, and consequently information that has been provided to operators will become obsolete. In the Australian context, these informational issues will be amplified by the diversity of operations and operating environments.

Where such informational issues exist, efficient regulation requires that risks are allocated to parties that are best able to manage them and can do so at least cost. The co-regulatory framework for rail safety that emerged in Australia is an attempt to implement this principle. As explained by BITRE:

Under co-regulation, the risk takers – the railway industry players – propose safety systems. They must be able to demonstrate to a safety regulator that such systems are fit for purpose and meet standards specified by that regulator. By implication, if

standards are prescribed, but are safety deficient for a given circumstance, then the risk arguably lies with the prescribing authority rather than the rail entity.<sup>119</sup>

The second factor that will affect the cost of regulation is the fragmented nature of the institutional arrangements that underpin regulation. Fragmented regulatory arrangements, in which requirements vary across jurisdictions, increase compliance and administrative costs for operators. Concerns surrounding such fragmentation have been the main driver behind the initiative to establish a National Law.

## 2.4 Summing up

The discussion serves to highlight that the existence of market failures could warrant a regulatory response. While the observations set out in section 2.2 suggest the need for regulation, they do not, in and of themselves, provide a basis for further regulation of hours of work and rest beyond the regulatory baseline for fatigue management already in place. What is relevant is the *incremental impact* of the proposed regulatory options. This requires an assessment of the extent to which the regulatory options:

- deliver incremental benefits— primarily in terms of risk reduction, relative to the strategies that operators and employers would take to manage risks, independently of regulation. These would include arrangements that are contained in EBAs; and
- impose incremental costs — when compared to the existing regulatory baseline.

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<sup>119</sup> Bureau of Transport and Regional Economics (BTRE) 2006, Optimising Harmonisation in the Australian Railway Industry, Report 114, pp208-214.

## 3 Regulatory options and the counterfactual

In this section, we discuss in greater detail the four regulatory options under consideration, and the counterfactual baseline against which they are assessed.

### 3.1 Defining the counterfactual

A fundamental point to note, in the context of this analysis, is that the baseline counterfactual is not the *status quo*. The analysis is not a before/ after analysis, but a comparison of the future in which one of the options is implemented, against one in which it is not (a “with/ without” analysis).

The future without any of the four options must consider policy developments that have taken place to date and which will be influential in the future. The RIS of July 2009 assessed the costs and benefits of having a single national rail regulator responsible for implementing a National Law. Therefore, the baseline used for this assessment assumes the following:

- The National Law has been implemented. This includes the provisions of section 29 of the National Regulation which specify what operators must consider in their Fatigue Risk Management Programmes (FRMPs) and requires operators to document procedures for managing fatigue-related risks<sup>120</sup>.
- The National Rail Safety Regulator has been established and there is a national accreditation scheme in place.
- Existing state-based variations continue in the way in which hours of work and rest for rail safety workers are further regulated.
- This means NSW retains the existing provisions relating only to train drivers as per Schedule 2 of its Rail Safety Act 2008.
- Other states and territories do not prescribe any working hour restrictions.

This means, in order to operate in NSW, operators will either have to:

- comply with Schedule 2 of the Rail Safety Act 2008 (NSW) which prescribes additional regulatory provisions relating to train drivers; for any operations in the state, or

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<sup>120</sup> The previous Model Regulations required rail operators to implement FRMPs; however, they were silent on the specific issues that should be considered. As a result local variations emerged. Under new Regulation 29, FRMPs must document hours of work and rest for rail safety workers, scheduling practices, suitable staffing arrangements for relief work and procedures for monitoring actual vs rostered hours worked. Operators must consider the kind of work being undertaken, physiological factors arising out of work practices, the suitability of rest environments, the risks arising from one off events and any relevant research that may be able to be applied.

- seek an exemption from this provision.

It is assumed this will be implemented by introducing NSW rail safety law which will apply in addition to the National Law.

In practice, operators' approaches are likely to reflect their own degree of risk aversion and agreements struck with employees (and their unions). The specific arrangements in these agreements may in many cases be more stringent than the requirements of the law and any policy options being considered as part of this RIS. This may be the case when the agreements struck are based on a broader set of considerations (rather than just fatigue), and when they determine the relative bargaining power of the employers and its employees. For example, any specific provisions on hours of work and rest may reflect considerations of the impact of shift work/length and hours of rest on employees' families and their social lives.

Evidence from consultations suggests that operators are meeting the requirements of Section 29 to the extent that they specify safe hours of work and rest. Larger operators suggested that they roster to meet specific rules regarding hours of work and rest which are typically based on their EBAs. In developing the master rosters they typically use bio-mathematical models (such as FAID) in order to take into account a broad set of factors that are believed to affect a workers' level of fatigue.

Tourist and heritage operators also typically roster to set rules relating to hours of work and rest. However, these tend to be less complicated. For example they may specify that rosters must allow for each worker to have no more than 12 hours on 12 hours off in a 24-hour period.

For all operators, and especially larger ones, an issue that arises is the discrepancy between *planned* rosters and the *actual* roster that is implemented. The difference arises mainly due to incomplete information: operators cannot foresee a range of variables that affect the actual availability of rail safety workers at a given point in time. These factors include ones that are specific to workers (e.g. health and fatigue), and broader operational ones (such as delays to certain services that have knock-on effects). The complication this creates is that it is actual practice that matters for fatigue-related risks and the assessment of these i.e. what we seek to measure is both the cost and benefits of changes to actual practice brought about by the options under consideration. To the extent that survey responses from stakeholders are based on data relating to *planned* rosters, it would be necessary to consider what adjustments may be necessary to the data to reflect the differences between actual and planned rosters. Some of the issues that arise in connection with this are discussed in sections 4.1 and 4.3.

For the purposes of this economic assessment, the incremental costs and benefits, associated with the various policy options being considered, are measured against the baseline where operators' FRMPs are presumed to comply

with the requirements of Section 29 of the National Law such that they specify hours of work and rest that:

- at a minimum comply with any existing state laws; or
- are based on their EBAs, where these are more stringent.

In this context, we observe that the consultative process revealed concerns (principally by regulators, but also by some operators) about disparities across operators in the capacity to implement effective FRMPs. It is recognised that this is an ongoing concern, and for that reason, it is reasonable to assume that efforts under the baseline will continue to be made to support the development of fatigue management capacity in the industry. For example, it is reasonable to assume that the type of research that has underpinned the development of Option 4 (see section 3.2.4 below) would also be available and could influence practices under the baseline. Similarly, technological developments that are relevant to fatigue management are unlikely to be dependent on which particular regulatory option is available. This reinforces the point that the baseline counterfactual is not the same as the *status quo*.

We recognise that the contents of an EBA will change over time. This includes agreements around hours of work and rest and any associated recompense for hours worked. In defining the baseline, we have assumed that the provisions in future EBAs may change to reflect changing employee and employer values and their relative bargaining power. But we have also assumed that these negotiations (and the ultimate provisions of the EBA) will be unaffected by the policy option adopted —i.e. the presence of any legislated safety net specifying hours of work and rest (except to the extent that it imposes a minimum requirement). While it is possible that the presence of a legislated safety net could affect the relative bargaining power of parties to the negotiation, there is insufficient evidence to support any assumption in this regard.

## 3.2 The policy options being considered

The reform options considered in this assessment are all aimed at implementing nationally-uniform requirements for regulating hours of work and rest for rail safety workers. The differences primarily relate to the level of prescription applied. This is obvious in the case of Option 2 compared with other options, insofar as Option 2 prescribes limiting values for hours of work and rest. But it is also present in a comparison between Option 1, on one hand, and Options 3 and 4 on other. The last two essentially prescribe outcomes that must be demonstrated through the assessment of the FRMPs that would be applied under Option 1.



### 3.2.1 Option 1 - No prescribed hours of work/rest

Option 1 involves the removal of existing legislated hours of work and rest for train drivers in NSW. This will have no effect on the regulatory arrangement in other states' relative to the baseline.

### 3.2.2 Option 2 - NSW arrangements applied nationally

Option 2 involves extending the arrangements in place in NSW to other jurisdictions such that maximum hours of work, and minimum periods of rest, will be prescribed for all train drivers.

This option would not impose any change on the regulatory arrangements in place in NSW relative to the baseline.

Under Option 2, the provisions of Section 29 of the National Regulations will continue to apply. That is to say, operators will still be required to maintain FRMPs and operate the systems required to sustain them, and regulators would need to assess them.

### 3.2.3 Option 3 – Simplified risk-based approach to setting hours of work and rest

This option requires regulators to apply a specified assessment framework (during accreditation/variation of the FRMP including when operators propose a change to any work scheduling practices and procedures set out in the FRMP) to determine the fatigue-related risk associated with operators' rostering.

The framework specifies 'outer limits' or minimum periods of intra-shift, inter-shift and inter-sequence breaks. The framework is intended to guide operators on the need to put additional controls in place to mitigate these risks. The point at which these additional controls would be needed is specified, although the form of the control required is not.

This framework would apply to all rail safety workers (unlike Option 2). Differences in the consequences of fatigue for the different rail safety workers are not considered.

This framework would apply to operators in all states.

### 3.2.4 Option 4 – Risk based approach with categorisation of workers based on the consequences

Like Option 3, Option 4 requires regulators to apply a specified assessment framework (during accreditation/variation of the FRMP including when operators propose a change to any work scheduling practices and procedures set out in the FRMP) to determine the fatigue-related risk associated with operators' rostering.

The framework specifies ‘outer limits’ or minimum periods of inter-shift and inter-sequence breaks. Unlike Option 3 however, intra-shift breaks are not considered. Again, these are not expected to bind.

Like Option 3, this framework applies to all rail safety workers, however, under Option 4 operators are required to categorise their different classes of rail safety workers based on the consequences that may emerge should their performance be degraded by fatigue. This assessment results in an additional set of ‘aggregate’ outer limits for each worker category that relates to the combinatorial risks associated with the proposed inter-shift and inter-sequence breaks.

Depending on the level of risk associated with their roster, operators may need to put additional controls in place to mitigate this. The point at which these additional controls would be needed is specified, although the form of the control required is not.

This framework would apply to operators in all states and to all rail safety workers.

### 3.3 CBA parameters and assumptions

The economic assessment has been undertaken in line with standard industry practice and the guidelines contained in the Best Practice Regulation Handbook<sup>121</sup>.

The following parameters have been adopted in this appraisal.

- The base year adopted for presenting all prices is 2011.
- Any capital costs (for both the regulator and operators) associated with implementing the new policy are assumed to be incurred in 2011.

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<sup>121</sup> Australian Government (2010), Best Practice Regulation Handbook, Canberra, June 2010

## 4 Categories of impacts

In this section, we set out the main categories of impacts that can be expected as a result of implementing the proposed changes to the further regulation of hours of work and rest. These categories inform the detailed assessment of the options that is conducted in section 5 of this report.

### 4.1 Impact of different policy options on the risk of fatigue-related incidents/accidents or other fatigue-related costs

This category captures the extent to which fatigue-related risks change as a consequence of changes in practice that are themselves a consequence of the change in regulation. It is important to emphasise that what is sought is evidence of a causal connection linking the implementation of a particular regulatory option to changes in risk *via* changes to fatigue risk management practices, and a comparison of this causal connection with that of the counterfactual scenario.

#### 4.1.1 Limitations in linking changes in risks to changes in regulation

As observed in section 2.1, the evidence linking fatigue per se to accidents and incidents is very limited. By extension, establishing a causal connection between changes in practices (that result from changes in the form of regulation) to changes in risk is even more difficult. This difficulty in attributing changes in risks to changes in regulatory arrangements is exacerbated by the fact that:

- The envisioned changes to regulation are to be evaluated against a benchmark that accounts for enterprise-specific arrangements that govern fatigue management practices (contained in EBAs or other documents). Feedback from some of the larger operators suggests that their existing EBAs are stricter than prevailing regulatory requirements. This limits the possible impact of changes in regulation on risks.
- Feedback from stakeholders suggested that there are difficulties in considering the impact of changes in fatigue management regulation on accidents and incidents, in isolation from safety management more generally. For example, a move away from night shifts may increase fire risks for rail grinding crews and increase workers' heat stress and UV exposure resulting from the need to work during hotter periods of the day. It may also lead to suboptimal protection due to increased frequency of trains during day shifts.

There may also be work-life balance impacts by reducing the consecutive days off<sup>122</sup>.

Another issue to take into account is that many of the main factors that we would expect to have a bearing on fatigue-related risks, such as changes to the market environment, developments in the science of fatigue management, and innovations in fatigue management technology, can be expected to occur under the counterfactual and irrespective of which of the four regulatory options apply.

There are thus both a priori and empirical grounds to suggest that the impact of regulatory changes on fatigue-related risks will be limited.

#### 4.1.2 The impact of the form of regulation

An alternative way of considering this issue is ascertaining whether a particular form of a regulation is more likely to reduce risks. More specifically, it must be established whether more prescriptive forms of regulation reduce risks to a greater extent than less prescriptive forms (setting aside, for the moment, the question of whether these more prescriptive forms of regulation impose higher costs of implementation and compliance).

Mixed evidence was received from regulators on this issue. Transport Safety Victoria (TSV) commented industry knowledge and understanding of good practice in fatigue management may not necessarily improve as a result of specifying outer limits.

In contrast, ITSR believes that safety standards would decline without a prescribed safety net. It considers that a legally-binding outer boundary serves to prevent extreme situations such as double shifts, short turnarounds and excessive numbers of consecutive shifts, even if it does not, in and out of itself, represent an adequate level of safety. But this would be true only if FRMPs that were developed in compliance with Section 29 of the National Regulations, and EBAs, were not able to prevent such extreme situations.

Moreover, it is possible for prescriptive approaches to reduce the efficacy of risk management. Thus TSV commented that:

Achieving safety benefits on the ground would also depend on the interpretation of this prescriptive element by regulators and industry. Based on TSV's interactions with industry for example, we can foresee the prescription of maximum work hours may lead to some operators using these inappropriately as target standard hours rather than as outer limits. This is particularly so for those operators in the industry who do not have the skills and knowledge to manage fatigue appropriately, setting limits on hours and specifying rest breaks provides a fall back position that in theory should be easier for operators to comply with.

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<sup>122</sup> Points raised in the submission of an operator (responsible for providing, maintaining and managing access to the rail network) to NTC Request for regulator input: Economic data – hours of work & rest, date of Submission: 4 January 2012.

Feedback from operators was more consistent in highlighting some of the drawbacks of prescription in terms of risk management. Both an operator providing passenger services and a large national freight operator submitted that operators in general could become highly reliant on any rostering principles in a safety net where these are the primary method for addressing fatigue risk. This is because they may presume that these prescribed hours are “safe”. This same national freight operator also submitted that because of this, a prescriptive system may suppress the workforce from developing a more mature attitude to fatigue management. They also suggested that prescribed safety nets may inhibit more effective risk management practices from being implemented. In particular, it submitted that:

- Prescribed safety nets may divert attention away from addressing an employee’s Fitness for Work more generally (to which fatigue is only one contributing factor). It suggested that these risks can be better addressed through ongoing education, management and monitoring of all workers.
- Methods that attempt to address fatigue management in isolation, may fail to account for other safety risks that are created by implementing a prescriptive roster.
- Complying with mandated rostering rules may absorb resources that could otherwise be focussed on other more important aspects of safety improvement.

More generally, prescriptive approaches are costly because they seek to shift the burden of risk management away from operators, who are best placed to control these risks, to the regulator. Where information is incomplete and asymmetric, and there is a wide range of operators, a regulator will rarely be in a position to understand the range of risks affecting an operator, and how best to manage them. As already observed, this explains why operators usually perceive large costs associated with such approaches, and indeed, it explains why, in tandem with the liberalisation and privatisation of rail operations in Australia, a co-regulatory approach has been favoured.<sup>123</sup>

### 4.1.3 Summary

- On the basis of this discussion, we find the following with respect to the impact of regulations on fatigue-related risk:
- It is not possible to differentiate between the options under consideration in terms of the attributable impact they have on safety risks relative to the baseline.

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<sup>123</sup> Bureau of Transport and Regional Economics (BTRE) 2006, Optimising Harmonisation in the Australian Railway Industry, Report 114, pp208-214.

- There is insufficient evidence to say that greater levels of prescription will improve risk management outcomes.

Therefore, in this economic assessment we have not attempted to quantify the impact of the different policy options on the risk of fatigue-related incidents and accidents relative to the baseline. Instead our approach is to consider how the options proposed fare against the other categories of proposed impacts, which are, in the main, related to implementation and compliance costs. Where there are material changes to these categories, we consider whether it is plausible to assume concomitant changes in risk related impacts that could affect the cost-benefit calculations.

## 4.2 Operators' administrative compliance costs

For an operator, the administrative costs of complying with any regulations (or the avoided costs of not complying) will reflect:

- Any investments it needs to make to modify or develop new reporting and information management systems; and/or employ additional staff to manage these systems in order to implement the regulations and demonstrate compliance.
- The costs incurred in dealing or negotiating with the regulator throughout any additional accreditation, notification or exemption processes (i.e. over and above what is required under the baseline). This may include the need for management and staff time to complete monitoring forms, assist with audits and prove compliance to the regulator; and the cost of obtaining advice from external sources.

These costs are distinct from the costs that regulations may impose on operators by constraining their rostering practices (an issue that we consider in section 4.3).

The purpose of the analysis is to identify how the different policy options could affect these different categories of compliance costs. The following factors are considered to be important in this regard.

First, it is important to recall that under the baseline, operators are already required to implement FRMPs which specify safe hours of work and rest<sup>124</sup>. Therefore, what is important is the expected *incremental* impact of any of the specified policy options on administrative compliance costs. We would expect regulatory options that require additional information, to that required for implementing FRMPs (such as information demonstrating compliance with prescriptive hours of work and rest or an “outer limit”), would add to costs.

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<sup>124</sup> An operator's overall compliance cost are likely to be driven by the requirement to produce an FRMP and other factors such as the capacity of the regulator and the extent of asymmetric and incomplete information. These factors are unaffected by the policy changes being considered.

Some operators have provided commentary on the additional administrative compliance costs associated with prescriptive requirements, but have not commented on the materiality of such costs.

Secondly, policies that lead to a nationally-standardised accreditation process could reduce compliance costs for multi-jurisdictional operators who may be able to streamline their information management and regulatory reporting systems. Operators have not provided significant commentary on this.

Finally, it is possible that an operator's compliance costs (associated with interacting with the regulator) will be affected by the subjectivity of the process. By this we mean situations where an operator is uncertain of what information is required to satisfy the regulator of its compliance. It is sometimes suggested that prescriptive, black-letter regulation can reduce uncertainty and therefore reduce regulatory costs.

It is doubtful whether prescription would reduce administrative compliance costs for operators. There are several reasons for this.

Firstly, while prescription may affect formal compliance requirements, it will not reduce the need to further satisfy the regulator, if it views the prescribed hours as only a safety net rather than acceptable practice. If regulators are concerned (as discussed in section 4.1) that prescriptive methods encourage slippages in fatigue management practices, then they are likely to continue to seek information from operators that will satisfy their concerns. This is particularly true in relation to the options under consideration, which are all implemented within a co-regulatory framework and in which any prescriptive elements of regulation would be additional to other provisions.

Secondly, the subjectivity of the process (and therefore operators' compliance costs) is more likely to be a function of the regulatory regimes clarity; and the capacity of operators and regulators to understand the regime rather than of the form of regulation itself or the level of prescription.

Thirdly, none of the operators have suggested that increased prescription would reduce the costs they incur by interacting with regulators.

### 4.3 Costs of achieving compliant rosters

These costs reflect the impact of changes to rostering practices that result from changes to regulations. They will typically reflect:

- Additional staff costs — operators may need to increase the labour force to comply with requirements. For example, a route may need to change from a driver-only to a two-driver route in order to comply with regulations and meet service expectations/timelines that are required by clients. Or additional infrastructure workers may be needed in order to deliver against existing capital maintenance programmes with shorter duration shifts.



- Capital costs — operators may need to undertake additional capital investments (for example to construct new sidings).

The costs of achieving a compliant roster will differ depending on the specific nature of the operator being considered. Survey responses suggest that under some of the policy options the impact may differ depending on whether or not they:

- Operate in NSW — For example, operators outside NSW would potentially face, under Option 2, more binding constraints on their rostering practices.
- Operate interstate or long-distance routes — Operators serving routes which involve a longer journey time may find any change in the safety net or additional controls on outer limits more likely to impact on their rostering arrangements. This is because their existing rosters are likely to be relatively closer to these safety nets. In addition, any unexpected delay are more likely to push them closer or over any safety net.
- Service the export market — Operators servicing the export market (such as mines and grain exporters) may find their freight loads are more variable as they are more likely to respond to changes in world commodity prices. This may mean they face peaks in demand which affect their ability to plan their rosters. During these peaks they may find themselves close to, or even over, any safety net.
- Operate passenger services with complex timetables — While individual long-distance routes may be directly affected by any safety net, shorter-distance scheduled passenger services could also be affected. Particularly if an individual employee's shift involves repeat journeys or middle-distance round trips that may no longer fall within a safety net.
- Undertake track maintenance — Track maintenance workers may be more likely to work longer shifts, at night, and over other periods when the railway is not in operation.

The scenarios described in the second, third, and fifth points of this categorisation illustrate how rostering is complicated by the effects of incomplete information. This means constraints that are imposed on actual rosters (as opposed to planned rosters) can lead to efficiency losses by reducing the ability of operators to respond to unforeseen events.

The actual impact of prescriptive safety nets (or their repeal in the case of Option 1) will depend on whether an operator is able to seek an exemption from the regulator on the grounds that it is able to put sufficient risk management processes or controls in place. The likelihood of this will depend on the costs involved in seeking exemption and the likelihood of success.

## 4.4 Regulators' administrative costs

Based on the baseline described we are assuming that fatigue risk management is already under the purview of the National Rail Safety Regulator. This has the following implications:

- Irrespective of whether there are economies of scale or scope<sup>125</sup> associated with national oversight, the benefits associated with any reductions in regulatory compliance costs as a result of the move to a national regulator should be ignored. This is because they are accounted for in the previous RIS<sup>126</sup>.
- Any one-off transition costs associated with creating the national regulator can be ignored on the basis that these have been considered in the previous RIS.

That said, policy options that prescribe new hours of work and rest or outer limits could result in additional:

- one-off costs for the regulator associated with recruiting, educating and training existing staff, developing new systems, and working with operators to bring them up to speed on the new requirements.
- additional ongoing costs associated with the need for additional staff to audit and monitor compliance as well as educate other staff, and to inform and maintain records. This would be the case if the amount of record keeping required increases under the policy option.

The question of whether regulator administrative costs are affected by the extent to which regulation is prescriptive is a matter of debate.

The NSW regulator, ITSR, considered that regulatory approaches that prescribed 'safety net' hours of work/rest are to some extent self enforcing. ITSR suggests that this approach require less regulatory resources "as the workforce themselves can quickly identify breaches and address them internally"<sup>127</sup>. On this basis it submits that non-mandated approaches require more proactive regulatory involvement and therefore higher compliance costs.

TSV submitted that prescription could reduce regulatory costs by simplifying interaction the regulator and the operator. At the same time, TSV also noted that

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<sup>125</sup> Economies of scale are defined as the cost advantages which accrue to a firm as its output expands while economies of scope refer to lower costs that can accrue from undertaking separate activities jointly.

<sup>126</sup> Most regulators were not able to identify any likely savings in administrative costs associated with improvements in inter-jurisdictional harmonisation under the various options (for example savings associated with staff needing to enforce only a single regulatory approach). ITSR in particular commented on this issue.

<sup>127</sup> NSW ITSR response dated 22 December 2011 to Request for regulator input: Economic data – hours of work and rest,

a more prescriptive approach (i.e. maximum hours or a specific methodology for determining hours of work and rest) may provide greater clarification for some in the industry and that this may reduce its interactions with operators around what is reasonable practicable<sup>128</sup>. However, TSV also noted that its inspection and audit costs could increase with a more specific element to enforce (particularly if it is complex) given the onus would then lie with the regulator. For example it may be required to collect and analyse more information when assessing compliance (i.e. more analysis of rosters) and to provide greater information, advice, and education to operators. As a result, TSV concluded that its inspection, audit and educational activities would be similar under a more prescriptive approach.

There are several reasons as to why the level of prescription is not likely to be material issue in considering the regulator's costs.

Firstly, as already observed in section 4.2, the options under consideration (and indeed the baseline) require the implementation of FRMP within a co-regulatory framework. If, within this framework, regulators are concerned about improving actual practice beyond the prescribed level, they will face costs that reflect the nature of this task. Prescription of limited aspects of work and rest will not have, in these circumstances, a material impact on regulatory costs.

Secondly, a reduction in compliance costs for regulators is more likely to be a function of the clarity of the regulatory regimes; and the capacity of regulators and operators to understand the regime rather than of the form of regulation itself or the level of prescription. While it may be the case, as suggested by that ITSR, that prescribed hours in legislation may help workers to verify and correct breaches, this sort of self-enforcement is also possible where an operator develops clear fatigue management processes and principles irrespective of the regulatory regime in place.

## 4.5 Harmonisation of regulation and impacts on costs and efficiency

Regulatory harmonisation has been prominent on the rail-policy agenda, and indeed is one of the major motivations behind the push for a National Rail Safety Regulator. In principle, uniform regulation across jurisdictions can reduce the costs of service provision, by reducing the extent to which parties need to make additional investments in labour and capital to ensure that their operations comply with jurisdiction-specific regulation.<sup>129</sup>

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<sup>128</sup> TSV comments on NTC Request for regulator input: Economic data – hours of work & rest; date of Submission: 20 December 2011.

<sup>129</sup> Bureau of Transport and Regional Economics (BTRE) 2006, *Optimising Harmonisation in the Australian Railway Industry*, Report 114, pp41-44.

These savings are *internal efficiencies* i.e. they take place within operators and are of direct benefit to them. A question of interest is whether they can lead to economic efficiencies from the point of view of society as a whole. Economic efficiency is promoted if the price of a good or service is lowered such that more individuals can benefit from it, or more of it can be consumed by individuals who value the good or service in question. In this case, harmonisation could foster economic efficiency if it promoted an expansion of services and of competition between operators. This is more likely to happen if:

- There are operators who are active in one jurisdiction which would increase their operations in other jurisdictions if the costs of doing so were lowered.
- There are operators who currently operate in many jurisdictions and that operate services on an inter-state basis which would increase their services or make cost savings if regulatory costs were lowered.

Some of the potential cost savings from harmonisation will be captured in the baseline because of the establishment of a national regulator and single point of accreditation. However, the baseline allows for state-based variation, while the proposed policy options differ in the way in which they deal with harmonisation.

In this context, it is important to emphasise that regulatory harmonisation is more likely to reduce costs when harmonisation is efficient i.e. the standard applied does not, in and of itself, create unnecessary costs (for example, through over-prescription). Where harmonisation is based on regulation that places unnecessary costs, the scope for economic efficiencies is diminished. That is because the increased costs can lead to increased prices and/or a contraction in services. Moreover, harmonisation through costly regulation can constrain the extent to which competition may develop in the future, and the future competitiveness of the rail industry.

Where operators face lower costs and fewer barriers, more operators will be encouraged to extend their services where they see opportunities to make profits. This could increase the level of competition in the industry. Increased competition may lead to greater choice for consumers. It could also incentivise operators to improve their efficiency. In a more competitive industry, operators less able to meet the needs of consumers and passengers at the lowest price will be more likely to exit the market. Conversely, operators who are more able to meet these needs will be more likely to remain. As a result the efficiency of the industry will be improved.

Unfortunately valuing the impact of any improvements in efficiency driven by an increase in competitiveness is extremely difficult. In particular it requires an estimate to be made of the impact on operators' prices. What can be said is that any impact may largely be confined to NSW and its adjacent states (i.e. Victoria and Queensland). The survey questions attempted to capture the views of

operators and regulators on the extent to which they believe harmonisation would lower barriers to competition.

By and large, operators did not indicate that any improvement in regulatory harmonisation would increase the likelihood that they would provide additional services in other jurisdictions. This is likely to be true for the localised passenger and tourist and heritage operators. This may not be accurate for the larger commercial-freight operators. Moreover, because of the timeframes involved, operators may not have been in a position to adequately consider the effect of regulatory harmonisation (and any associated change in compliance costs) on marginal routes.

In order to illustrate the issue of competition benefits, we present the following example. Suppose a new policy leads to improvements in competitiveness in NSW, Victoria and Queensland which results in a 0.01% fall in rail prices. This could be associated with an economic benefit of close to \$0.6 million. This is based on the assumption that these states account for almost two thirds of the gross value added in the industry which in 2010 was close to \$9 billion<sup>130</sup>.

We present this figure for illustrative purposes only, and it is not incorporated into the analysis presented in section 5. In that section, we provide some commentary on which of the four options could be expected, depending on whether the proposed option implied a higher or lower cost form of harmonisation.

Economic efficiency is not only a function of prices and competition. It is also promoted when the external social costs of an activity are reduced. One such example is the benefits that stem from reduced greenhouse gas emissions. To the extent that road emissions are higher than rail emissions, and are not priced in some way, increased cost competitiveness of rail could favour a shift from road to rail and a reduction in the social costs associated with emissions. Because of a lack of available data, we do not consider this particular question any further in this analysis.

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<sup>130</sup> Gross value added is the value of output at basic prices minus the value of intermediate consumption at purchasers' prices. The term is used to describe the gross product of an industry. (Source: Bureau of Infrastructure, Transport and Regional Economics (2011), Australian transport statistics yearbook 2011, BITRE, Canberra, ACT, p14). The proportion of this that is provided by NSW, Queensland and Victoria is unknown, however, we have assumed that it will equate to the proportion of total train kms in these states.

## 5 Summary of the assessment

In this section we provide an overview of the costs and benefits of the different policy options. The data that we have received through stakeholder consultation responses are not sufficient to estimate the net benefits of the options. We therefore focus on individual elements of the cost-benefit analysis that correspond to the categories of impacts set out in section 4 of this paper, and on responses (whether quantitative or qualitative) which have allowed us to provide some indication or commentary on the magnitude and sign of impacts. The impacts for each option are summarised in tables. Blank cells indicate an absence of data.

### 5.1 Option 1 - No prescribed hours of work/rest

Table 1 presents an overview of the main impacts under this option. The responses received suggest that the main impact (albeit small) would be a reduction in administrative compliance cost for operators operating in NSW.

In particular, one operator pointed to the administrative cost savings that would accrue from not having to demonstrate compliance with NSW-specific regulations— that would otherwise have continued to apply in NSW under the baseline. It seems reasonable to suggest that such cost savings could be generalised across operators with operations in NSW.

None of the operators that responded projected increased compliance costs as a consequence of the removal of prescribed maximum hours. This does not exclude the possibility that operators would need to invest more in FRMPs to achieve regulatory compliance; but such a requirement would also be applicable in the baseline counterfactual.

While in theory we would expect that the removal of prescribed maxima relating to hours of work could increase rostering flexibility and thus induce efficiency savings for operators, the feedback received suggested that such savings were negligible. According to both a large national freight operator and an operator providing passenger services, this is because EBAs that are applicable in NSW are equivalent to, or more constraining than, the prescribed maximum hours.

As reported in section 4.4, certain regulators were of the view that prescription could reduce their costs from reduction in the subjectivity of the process. If this were true, by implication, the removal of prescriptive requirements could increase the regulator's costs. In section 4.4, we observed that there were several factors that supported the view that prescription does not reduce administrative costs, particularly in situations where regulators have to verify compliance with a host of regulatory provisions.

This option does represent a change to current regulatory arrangements in NSW. ITSR reported costs associated with this change in NSW amounting to \$320,000 per year. But it is not clear to what extent these costs are applicable when measured against a baseline in which the regulator is obliged to ensure the implementation of the National Law and regulations pursuant to these. It is important to recall that Option 1 is the removal of the *additional* requirements associated with NSW.

It is also possible that the national regulator would benefit from costs savings associated with the harmonisation of regulation. In particular, it could reduce the incremental costs associated with implementing a specific regulatory regime in NSW. For example it may increase the scope for resource pooling i.e. increased ability to draw on staff and systems that apply to all jurisdictions (e.g. support from other offices of the national regulator to assist the NSW branch in its activities). However, none of the regulators reported expected costs savings as a result of harmonisation, though this is possibly due to the fact they were reporting based on their experience as state-based regulators. It could be argued that some proportion of any cost savings may actually be the result of having a single national regulator. Consequently, we have not included an estimate for such savings. However, the possibility of this benefit should be taken into account.

A final potential impact is associated with improvements in efficiency resulting from regulatory harmonisation. This is associated with regulatory harmonisation reducing the costs of, and barriers associated with, operating across state boundaries. None of the respondents suggested that there would be benefits from this option in terms of service expansion into NSW, or out of NSW. We have therefore not included an estimate of benefits from increased service provision and competition. However, reflecting the experience of other sectors, the possibility of such benefits should be taken into account.



Table 1 Summary assessment table for Option 1

Impact	Description	One-off	Ongoing
Costs of achieving compliant rosters	- In-principle the benefits of removing prescription in NSW are limited by the fact that EBAs, rather than regulation bind rostering arrangements		\$0 <sup>131</sup>
Operators' administrative compliance costs	- Responses point to cost savings in NSW stemming from no longer being required to prove compliance with prescribed maximum hours - No projections of increased costs relative to baseline due to lack of prescription		cost saving of \$10,000 pa <sup>132</sup>
Regulator's administrative costs	- Not significant		Vic: \$0 <sup>133</sup> NSW: cost of \$320k pa <sup>134</sup>
Industry competitiveness/ competition benefits	- Possible improvement in rail efficiency as a result of increases in competition resulting from harmonisation. <sup>135</sup>		

<sup>131</sup> A national freight operator claimed that its EBA requirements are presently more restrictive than the prescribed hours set by ITSR, therefore no change in rostering would occur imminently.

<sup>132</sup> Based on a national freight operator's estimates of savings based on the costs of external auditing services currently used to ensure compliance with ITSR standards.

<sup>133</sup> The Victorian regulator notes the costs of monitoring fatigue elements is typically subsumed into the day to day inspection/ audit activities as one of numerous items in considering a SMS. Therefore, Option 1 is expected to result in no significant change in benefits or costs from the proposed limited inter-jurisdictional harmonisation.

<sup>134</sup> ITSR estimates based on the need to hire an additional two compliance officers. These officers would cost \$160,000 each PA including on-costs and overheads.

<sup>135</sup> A tourist and heritage operator submitted that regulatory harmonisation would not lead it to consider operating interstate.

## 5.2 Option 2- NSW arrangements applied nationally

Table 2 provides an overview of the main impacts under Option 2.

The biggest impact is on operator costs stemming from the impacts on rostering from extending prescribed maximum hours (as per current NSW arrangements). Of the respondents, a single national freight operator provided the most detailed estimates of the costs on its operations outside NSW. These largely reflect the costs of additional full-time employees required to operate under rostering practices that are compliant with the prescribed maximum hours.

While no information was provided to this effect by other freight operators outside NSW, it is probable, based on the observations made in section 4.3 that these compliance costs would be substantial. On the basis of past information supplied by operators, the NTC reported that operators servicing the export mining sector could incur additional costs of \$185 million per annum over the forecast period based on the cost of employing additional train drivers.<sup>136</sup> NSW operators are assumed to already comply with NSW regulatory requirements.<sup>137</sup>

Submissions received to date have not provided quantitative data on operators' administrative compliance costs under Option 2. A national freight operator did submit that these costs could be significant, and would include the costs associated with modifying its present rostering systems nationally and the additional auditing resources (internal and external) needed to ensure compliance for its non-NSW operations. They also felt that cost savings from harmonisation would be minimal to negligible in the short term. However, they submitted that the increase in costs could be attenuated in the long term, depending on the operational and reporting requirements of the National Regulator and saving from having one rostering system (EBA permitting). An operator providing metropolitan and long distance passenger services highlighted that it was uncertain of how this option would be regulated by the National Rail Safety

<sup>136</sup> Interstate operators indicated that they would be likely to incur additional costs on average up to \$5.0 million pa as a direct result of implementing this option, which includes the cost of hiring additional staff. There are 37 commercial operators operating long-haul, interstate services, all of whom are expected to incur this cost. The total ongoing cost has therefore been estimated at \$185 million. It is considered that shorter-haul operators would be less likely to incur additional costs as they would be better prepared to regulate hours using their existing resource base. The total additional ongoing costs for all operators are estimated to be approximately: high \$340 million and low of \$85 million per annum. The low figure is estimated as 25 per cent of the high cost. ATHRA member responses have suggested that cost impacts for tourist and heritage operators would be minimal as in most cases these operators, operate for a limited number of hours in a day and many operate only a few days in each month. The larger tourist and heritage operators also tend to work limited hours. These figures do not take account of likelihood of operators seeking exemptions

<sup>137</sup> Note we have assumed there is no impact on the rostering arrangements of operators with operations mainly in NSW as they are assumed to already comply. The submission of an operator providing metropolitan and long distance passenger services was supportive of this assumption they indicated that their operations outside NSW are currently managed to within the NSW prescribed limits for ease of management.

Regulator including the level of documentation that would be required of operators to evidence their compliance. It maintains that without knowing specifically what these controls would require, it is impossible to provide estimates of compliance costs.

The option is not considered to have material impacts on the ongoing costs incurred by regulators relative to the baseline, in which regulators have to ensure compliance with the National Law and associated arrangements. There may be one-off costs associated with the transition to the new regime.

While harmonisation can enhance economic efficiency by improving the conditions for competition in rail services, we consider that the scope for improving economic efficiency through an extension the NSW model would be limited, or at any rate considerably less probable than under Option 1. This is because of the high costs of this approach on rail service providers in other jurisdictions (see section 4.5 for a discussion on the circumstances in which harmonisation is likely to promote competition and economic efficiency).

Table 2 Summary assessment of significant impacts for Option 2

Impact	Description	One-off	Ongoing
Costs of achieving compliant rosters	- Decrease in efficiency of operators' (outside NSW) driver rostering arrangements (i.e. increase in labour costs) for those currently not complying with NSW driver limits.	\$7.82m to \$21.27m <sup>138</sup>	National freight operator: \$13.6 to \$37million pa <sup>139</sup> Previous NTC estimate:\$185 <sup>140</sup>
Operators' administrative compliance costs	- Likely increases, attenuated by long term savings associated with harmonisation		

<sup>138</sup> A national freight operator estimated that there would be one-off training costs for the additional staff required. These were estimated at \$230,000 per train crew. If only half the new staff were train crew (conservative estimate) and half of those were trained internally (again, conservative), the one-off training cost would range from \$7.82m to \$21.27m (best to worst case scenario) (see footnote below for description).

<sup>139</sup> A national freight operator based these estimates on projections that it will change drive-only operations to two-driver operations. They estimated a best case scenario requiring an additional 136 FTE's, and a worst case scenario requiring an additional 370 FTE's.

<sup>140</sup> NTC, July 2011 RIS, p 187.

Impact	Description	One-off	Ongoing
Regulator's administrative costs	- Not considered to be significant relative to baseline.		VIC: \$0 <sup>141</sup> NSW: \$0 <sup>142</sup> TAS: marginally higher <sup>143</sup>
Industry competitiveness/ competition benefits	- Limited by high cost nature of regulatory approach		

<sup>141</sup> The Victorian regulator notes the costs of monitoring fatigue elements is typically subsumed into the day to day inspection/ audit activities as one of numerous items in considering a SMS. Under Option 2 they will continue to monitor and audit operators to ensure that their fatigue management programs are adequate. This will involve similar activities to TSV's current inspection/ audit program, with a planned specific focus on education activities for the coming years. On the one hand, costs may be expected to increase nominally given there is a more specific element (maximum hours) to enforce as part of an inspection/ audit. On the other hand, the addition of maximum hours may provide greater clarification for some in the industry and therefore reduce the extent of regulatory interactions on SFAIRP. Not feeling for the balance of these issues was provided.

<sup>142</sup> ITSR does not consider that Schedule 2 imposes an additional administrative cost for regulators. This is because all regulators must assess if the operator is complying with their own system, regardless of whether there are regulated limits or not. In fact they consider a mandated "safety net" is to some extent self enforcing in that it operates to prevent extreme scheduling practices in the first instance, rather than a non mandated approach which would require more proactive regulator involvement to determine compliance. It does not require substantial regulator resources as the workforce themselves can quickly identify breaches and address them internally. ITSR receives occasional notification of breaches from operators with information on corrective action. Workers also occasionally notify ITSR if they consider that there are repeat breaches.

<sup>143</sup> Due to need to test and assess compliance regardless of operators safety performance

### 5.3 Option 3

Table 3 provides an overview of the main impacts under this option. The feedback received from stakeholders on this option was affected by its relative complexity and the short time available to them to consider the implications for their operations.

The responses of operators suggests that the effect of this option on the costs associated with rostering could be significant for operators that:

- provide long-distance freight services; and
- for some providers of passenger services.

A national freight operator, in particular, identified compliance with requirements for intra-shift breaks as a significant source of costs. They provided information that suggested that compliance with the outer limits prescribed under this option could be more expensive than compliance with maximum hours prescribed under Option 2 (in which NSW maximum limits applied nationally). This relativity seems reasonable given the wider scope of prescribed outer limits under Option 3.

The operators also raised concerns with some of the control mechanisms specified under this option, such as alertness monitoring technologies. Some considered that the mapping of risks to control options envisioned by this option was questionable.

Freight operators and operators that undertake track maintenance also raised concerns in regard to whether this option would increase their exposure to uncertain future events, which can mean they are required to operate beyond the outer limits. The operators submitted that they had risk management processes to control for risks that arose in such circumstances, and that adding a layer of prescription would not necessarily manage these risks more efficiently. Some operators also pointed to the fact that night shifts for construction workers were organised as a means of optimising risk management across a range of risk factors, not just fatigue-related ones.

The administrative compliance costs for operators under this option are expected to reflect increased data and information gathering costs and costs related to developing necessary information and management systems as a result of the implementation of new prescriptive outer limits (costs may vary for small and large operators). The latter are expected to be one-off costs. There would also be cost savings associated with cross-jurisdictional harmonisation under this option.

For regulators, one-off transition costs could be expected given the need to develop their capacity to implement this option. No precise feedback was provided as to how this option would increase ongoing costs of regulation

relative to the baseline. And it is difficult to establish *a priori* whether ongoing costs would increase or decrease.

As with other options, the scope for competition benefits from harmonisation needs to be considered. But as already observed, the extent of such benefits may be restricted if the harmonisation occurs to a standard that is at an inefficiently high cost. This is a risk under this option, on the basis of suggestions that the option entails various compliance costs without substantially affecting safety outcomes. Consequently, it is likely that any competition benefits that result from this option would be lower than those that may arise from Option 1.



Table 3 Summary assessment table for Option 3

Impact	Description	One-off	Ongoing
Costs of achieving compliant rosters	Increase in costs for operators with operations outside the “outer limits”	\$12.19- 21.27m pa <sup>144</sup>	Shut down and emergency working <sup>145</sup> \$21.2 to \$37million pa <sup>146,147</sup>
Operators’ administrative compliance costs	<ul style="list-style-type: none"> <li>- Ongoing data collection and monitoring costs</li> <li>- One-off costs of developing and transition to new systems</li> <li>- Mitigating long term effect of implementing a harmonised regulatory approach across all jurisdictions</li> </ul>		

<sup>144</sup> Taken from a national freight operator’s estimate of ongoing costs (see footnote below). These do not include training costs for the additional staff required, estimated at \$230,000 per train crew. They suggest that if half the new staff were train crew (conservative estimate) and half of those were trained internally (again, conservative), the one-off training cost would range from \$12.19m to \$21.27m (best to worst case scenario).

<sup>145</sup> Two operators that provided infrastructure services suggested that the outer limits would restrict night-time construction and safety work. One suggested that to comply with this option, an additional 25% resources, would be required for night duty operations.

<sup>146</sup> A national freight operator estimated a best case scenario requiring an additional 212 FTE’s, and a worst case scenario requiring an additional 370 FTE’s. These additional FTE would comprise Train Crew, Yard Staff and Operations Deployment and Logistics personnel. Based on a conservative estimate of \$100,000 p.a. unit rate per FTE, the additional ongoing cost for personnel only would range from \$21.2 to \$37million per annum.

<sup>147</sup> An operator responsible for providing, maintaining and managing access to the rail network indicated they would incur costs associated with complying with the length of sequence, particularly for construction teams working away from home station. Paid fatigue days mid block (for a 30 man construction team this equates to \$25,000 per day).

Impact	Description	One-off	Ongoing
Regulator's administrative costs	<ul style="list-style-type: none"> <li>- One-off transition costs</li> <li>- Impact ongoing costs unknown</li> <li>- One off transition costs and any increase in ongoing costs could be mitigated by savings from implementing a uniform regulatory approach through a single regulator</li> </ul>		
Industry competitiveness/ competition benefits	<ul style="list-style-type: none"> <li>- Limited by higher-cost nature of harmonisation</li> </ul>		

## 5.4 Option 4

Table 4 provides an overview of the main impacts under this option. As with Option 3, the short timeframes for responses, and the relative complexity of this option, affected the level and precision of the feedback received.

The cost drivers for operators follow the same logic as under Option 3, which is to be expected given the affinity between Options 3 and 4. Where estimates of rostering compliance costs were provided, these were lower for Option 4 than Option 3. Again, this is an intuitive outcome, given that Option 4 provides for classifying workers by risk consequences, and links control measures to identified risk consequences. This allows for a greater prioritisation of resources by operators than under Option 3. Also the fact that prescriptive conditions on intra-shift breaks are not proposed under Option 4 reduces its costs impact relative to Option 3.

As with Option 3, operators submitted that the prescribed outer limits would impose some constraints on efficient rostering and efficient risk management. In particular, they reiterated the point, made in relation to Option 3 that rostering took into account a range of safety risks, and not solely those related to fatigue. Prescribing limits based on fatigue could therefore lead to a sub-optimal degree of risk management.

Administrative costs for operators include one-off costs associated with the transition to a new system and ongoing costs related to data gathering. It is probable that ongoing costs are slightly higher in Option 4 relative to Option 3, because the more detailed process of risk assessment, but that this difference would be relatively small compared to the savings in costs associated with rostering under Option 4 compared to Option 3. Like Option 3, there would also be cost savings associated with cross-jurisdictional harmonisation under this option.

The regulator would face one-off transition costs associated with moving to a new system. As with Option 3, no data were made available, nor was there any compelling a priori reason, to suggest that ongoing costs would be materially different compared to those under the baseline.

As with Option 3, potential inefficiencies in the regulatory approach could constrain the benefits that could accrue, through the scope for expanded competition, from regulatory harmonisation.

Table 4 Summary assessment table for Option 4

Impact	Description	One-off	Ongoing
Costs of achieving compliant rosters	Increased in costs for operators with operations outside the “outer limits”	\$4.54m to \$7.76m pa <sup>148</sup>	Shut down and emergency working <sup>149</sup> \$7.9 to 13.5million pa <sup>150</sup>
Operators' administrative compliance costs	<ul style="list-style-type: none"> <li>- Ongoing data collection and monitoring costs</li> <li>- One-off costs of developing and transition to new systems</li> <li>- Mitigating long term effect of a harmonised regulatory approach across all jurisdictions</li> </ul>		
Regulator's administrative costs	<ul style="list-style-type: none"> <li>- One-off transition costs</li> <li>- Impact ongoing costs unknown</li> <li>- One off transition costs and any increase in ongoing costs could be mitigated by savings from implementing a uniform regulatory approach through a single regulator</li> </ul>		

<sup>148</sup> Taken from a national freight operator's estimate of ongoing costs (see footnote below). This did not include training costs for the additional staff required, estimated at \$230,000 per train crew. They submit that if only half the new staff were train crew (conservative estimate) and half of those were trained internally (again, conservative), the one-off training cost would range from \$4.54m to \$7.76m (best to worst case scenario).

<sup>149</sup> This largely reflects unexpected events and emergencies

<sup>150</sup> Based on a best case scenario, a national freight operator submitted that they would require an additional 79 FTE's, and at worst case an additional 135 FTE's, and a conservative estimate of \$100,000 p.a. unit rate per FTE.

Impact	Description	One-off	Ongoing
Industry competitiveness/ competition benefits	Limited by higher-cost nature of harmonisation		

## 5.5 Comparative assessment of options against the baseline

We draw on the analysis presented in the preceding sections to establish a ranking across the different options. The paucity of data precludes us from establishing a ranking based on the net present value of net benefits associated with each option. Instead we draw on available information and data to establish, for each category of impact, relative option rankings.

The results are reported in Table 5. For each category of impact, we have assigned a ranking from 1 to 4. A ranking of 1 is assigned to the option with the most favourable impact relative to the baseline (i.e. the smallest increase in cost, or the greatest decrease in cost).

Table 5: Comparative ranking of options

Cost type	Option 1	Option 2	Option 3	Option 4
Operators' costs of achieving compliant rosters	1	3	4	2
Operators' administrative costs	1	2	3=	3=
Regulator's administrative costs	By and large limited to one-off transition costs, and unlikely to be materially different across options.			
Industry competitiveness/competition benefits	1	3=	3=	2
Overall ranking	1	3	4	2

Because of data constraints, the overall rankings are unweighted i.e. each impact category is treated as equal. In practice, this may not be the case; indeed, it is plausible to suggest that the first category (“operator costs of achieving compliant rosters”) should be assigned the greatest weight on the basis of the data received. In any case this would not affect the overall rankings which align with the rankings for this cost category.

The rankings suggest that Option 1 is the preferred option. This result appears plausible, and can be explained by several factors.

First, as already observed in sections 2.3, 4.1 and 4.3, greater levels of prescription in situations of asymmetric and incomplete information may increase the costs. Option 1 is the least prescriptive of those considered. Both Options 2 and 3 are prescriptive, but Option 3 most expands the scope of prescription. The data provided on the costs of achieving compliant rosters – the largest impact category – reflect the impact of prescription. For example, the data provided by one national freight operator shows that costs (as measured by the mean of the cost range provided) are highest for Option 3, and lowest for Option 1.

An alternative way of thinking about the logic of this outcome is to consider that less prescriptive approaches such as Option 1 are better at providing regulators with the *option* of adjusting requirements and improving practices in light with new information and innovation. These include, for example, new research into the science of fatigue management or new developments in technology that can help manage fatigue. If for example, new research shows that stricter requirements are appropriate for particular operating environments then these can be reflected by the regulator in its dealings with the operator. Indeed, as already observed, it is precisely this adaptability and responsiveness that has been sought under the co-regulatory approach in the first place. By contrast, more prescriptive approaches are not as good in taking into account the “option value” associated with new developments.

It is important to underscore the fact that while Option 1 is favoured as a consequence of this analysis, that does not bring to nought the substantial research in the area of fatigue management undertaken in the development of Option 4 (most notably). Rather, the key issue at hand is how best to implement this knowledge. Nothing in this analysis rules out that this knowledge could be brought to bear on rail operations by strengthening the capacity of both regulators and operators, through training and information dissemination. Indeed it seems reasonable to suggest that this would happen under any of the options, and indeed the baseline counterfactual. The key issue is that the existence of such knowledge, and the possibility of disseminating it, is not dependent on a particular regulatory option. Instead the regulatory options determine the degree of prescriptivism with which such knowledge is applied to industry.

Because Option 1 imposes lower costs – particularly in terms of administrative costs and the costs of achieving compliant rosters – harmonisation based on this option is more likely to promote economic efficiency through service expansion and competition. Even if the initial impact on competition is marginal, a lower cost form of harmonisation will be more conducive to the development of competition in the future.

From the perspective of this analysis, the issue is not only which of the four options is preferable, but also whether the preferred option is superior to the counterfactual. As already explained in section 3.1, the counterfactual is not the



status quo. Rather, it is a future state of the world in which the assumptions set out in section 3.1 hold. Against this baseline, the main advantages of Option 1 are that:

- It reduces administrative compliance costs, mainly for operators. This cost reduction is essentially a reflection of harmonisation benefits. That is to say, under Option 1, operators benefit from savings that result from not having to address compliance with NSW-specific regulation.
- It has, potentially at least, the benefit of promoting economic efficiency, particularly in relation to cross-border and multi-jurisdictional operations.

As observed in section 5.1, the repeal of provisions specific to NSW is not expected to have a material impact on costs associated with compliant rosters in that state because the binding constraints on rostering stem from EBAs.

It is unlikely that any of the other options presented would be preferable to the counterfactual. This is primarily because of the compliance costs that they impose – especially in terms of operational efficiencies – relative to the counterfactual.

Table 6 below re-presents the results of our analysis with the options ordered relative to the counterfactual. For each category of impact, we have assigned a positive or negative ranking relative to the counterfactual of 0. A positive ranking (+) is assigned to options with a favourable impact relative to the baseline and a negative ranking (-) is assigned to options with an unfavourable impact. Ranking of -- are assigned to options with increasingly unfavourable impact relative to the baseline.

Table 6: Ranking of options relative to the counterfactual

Cost type	Option 1	Baseline	Option 4	Option 2	Option 3
Operators' costs of achieving compliant rosters	0	0	-	--	---
Operators' administrative costs	+	0	--	-	--
Regulator's administrative costs	By and large limited to one-off transition costs, and unlikely to be materially different across options.				
Industry competitiveness/competition benefits	+	0	-	--	--
Overall ranking	+	0	-	--	---

Consistent with the previous discussion **Table 6** highlights that Option 1 is favourable relative to the baseline while all other options are unfavourable. Option 3 is the least favourable because it most expands the scope of prescription.

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