



National Heavy Vehicle Regulator

Risk Classification System for Advanced Fatigue Management Policy

Version 2.0, June 2013

Executive Summary

Due to inconsistencies in the implementation of the *Road Transport – Heavy Vehicle Driver Fatigue Act 2006* (the Model Law) across participating jurisdictions, specifically in the implementation of Advanced Fatigue Management (AFM), the Standing Council on Transport and Infrastructure (SCOTI) determined that new national law be implemented to coincide with the introduction of the National Heavy Vehicle Regulator (NHVR). SCOTI directed the National Transport Commission to form an Independent Expert Panel to gather the scientific evidence and make recommendations on the best approach for AFM on a range of issues.

The Independent Expert Panel recommended a risk trading approach to AFM, where Operators would need to offset high risk work practices (e.g., long work opportunity) by introducing risk mitigation strategies (e.g., longer and more frequent breaks). A Risk Classification System to show the relative levels of fatigue risk associated with combinations of work and rest was developed.

The intention was for the Risk Classification system to provide guidelines for assessing AFM applications improving administrative efficiency and increasing transparency and certainty of outcome. The arrangements for BFM and Standard hours would not change.

The approach outlined by the Independent Expert Panel to SCOTI was accepted in principle at their meeting of May 2010 with the request that the NHVR examine the safety implications of an outer limit of a 17 hour work opportunity as proposed by the Panel. The NHVR has engaged with fatigue experts, transport industry and regulators to examine issues associated with:

- evidence to support the Risk Classification System.
- outer limits.
- governance and administrative arrangements for AFM utilising the Risk Classification System.

This policy provides an overview of prescriptive and performance based approaches in the transport sector and outlines the benefits of a hybrid approach combining both prescriptive approaches of Standard Hours and BFM and the performance based approach of AFM.

The Risk Classification System defines three (3) dimensions and seven (7) principles which, based on scientific evidence, are able to be used to assess the relative risk of work schedules proposed by applicants for AFM. A scoring system has been developed to support the risk matrix. The NHVR will assess applications below a threshold risk limit or where the application utilises a published template. Applications above the threshold will be referred to a Fatigue Expert Reference Group for advice before the NHVR makes a decision.

The Risk Classification System will assess work opportunities and sleep opportunities as part of a work schedule. A work opportunity includes all periods of work, including driving and non-driving work and periods of short rest taken during the shift. It is important to understand that the scoring under the Risk Classification System is not the sole basis on which an AFM application will be assessed – it is one element only. The Operator's safety management system and specific mitigations around the higher risk elements of the proposed schedule will be considered as a whole in assessing an application.



Where AFM applications are approved the NHVR may publish a template which can be referenced by other applicants. Where a published template is used new applicants will have a high degree of assurance that their applications will also be approved provided their work schedules, including any risk mitigations not included in the Risk Classification are also provided for.

Fatigue is an inexact science and there are no limits or arrangements which can guarantee that an individual driver is not fatigued. However, research provides a sound basis on which to assess the likelihood of fatigue risk and it is this research which has driven the development of the Risk Classification System. Based on research and historical AFM arrangements an outer limit of 17 hours work opportunity will be applied. Either side of this work opportunity there must be sleep breaks of 7 hours or more. Taking in to account minimum short rest breaks during the period of work this will result in a 15.5 hour outer work limit. This compares to the 15 hour work limit current applied by NSW and Victoria and 16 hours applied by Queensland and South Australia. An outer limit of 17 hours ensures at least 7 hours as an opportunity for sleep. This would support 6 hours of actual sleep, the minimum found by some research to be required to reduce fatigue risk. As part of the AFM assessment under the Risk Classification System consideration will also be given to the frequency of reset rest breaks which are breaks of more than 30 hours which include two night rests (rest between midnight and 6am).

Published templates of more commonly used work arrangements sought under AFM can be used by Operators to minimise the work involved in making an application. In addition, the availability of an on-line coaching tool which will enable industry to test proposed work schedules under the Risk Classification System and make modifications where appropriate. The provision of templates and the on-line coaching tool will provide increased certainty of outcome, reduced effort in applications and increased certainty of the likely application outcome. These changes are expected to deliver the administrative efficiency sought by Operators and espoused by the Independent Expert Panel.

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1 Introduction

The purpose of this policy is to provide of an overview of revised arrangements for Advanced Fatigue Management (AFM) and its operation under the Heavy Vehicle National Law (HVNL). Specifically it outlines the Risk Classification System (RCS) and its development and application.

The Road Transport Heavy Vehicle Driver Fatigue Act, known as the Model Law was adopted into State law by South Australia, Victoria, New South Wales and Queensland in 2008. It provided for three tiers of arrangements related to fatigue operations for heavy vehicles:

- Standards hours – the default operating arrangements.
- Basic Fatigue Management (BFM) – providing more flexible work schedules for operators accredited under the standards prescribed in the National Heavy Vehicle Accreditation Scheme (NHVAS).
- AFM – provided for transport operators to present a case for work schedules that were outside those provided for under Standard Hours and BFM on the basis that they could demonstrate the safety of proposed arrangements. Applications were assessed on a case by case basis.

As with all national model law, jurisdictions are responsible for the introduction and operation of the legislation in their state or territory. This can result in variations between jurisdictions.

In the case of the Heavy Vehicle Driving Fatigue (HVDF) New South Wales and Victoria adopted a 15 hour outer limit for AFM as opposed to the 16 hour limit outlined in the Model Law and implemented in Queensland and South Australia.

This difference in outer limits led to confusion and operational complexity for transport operators. In response to this the Standing Council on Transport and Infrastructure (SCOTI), formerly called the Australian Transport Council, directed the National Transport Commission (NTC) to form an Independent Expert Panel (IEP) to bring together the scientific evidence for a best practice approach to AFM to be included in the HVNL being developed for the National Heavy Vehicle Regulator (NHVR).

The IEP were asked to provide advice on a number of outstanding issues including:

- a participant in the AFM module is subject to a 16 hour outer limit for work hours. Does a 16 hour outer limit within an AFM program represent an acceptable level of risk for drivers and the community?

The IEP met for the first time on the 30 June 2010 and after consulting with regulators and jurisdictions, recommended the implementation of a RCS to support the operation of AFM. The RCS would involve a risk classification matrix that would be used to assess fatigue related risk of AFM applications. AFM arrangements would be given a score based on their risk profile, and systems that scored below a baseline threshold would be approved without the need for expert advice.



An initial report was provided to SCOTI in September 2010 and a final report in May 2011. SCOTI approved the recommendations outlined by the IEP report, on the proviso that sound evidence was provided that there would be no increase in fatigue-related risk by changing the maximum work hours from 15 hours in a 24 hour period to a 17 hour work opportunity (including rest breaks) under the proposed new system.

The aim of this policy paper is to:

- provide a rationale for a move to the revised arrangements for AFM incorporating an RCS.
- address the issue of outer limits as raised by SCOTI.
- discuss the implementation arrangements to underpin the new AFM operations under the HVNL.

2 Glossary of Terms

The table below defines terms used throughout this document. The terms, such as work opportunity, work related rest, recovery and reset breaks, are not defined in the HVNL legislation but have been developed to assist in determination of relative fatigue risk for an AFM application.

Enforcement will be undertaken based on the HVNL definitions of work and rest and in reference to the AFM certificate which will specify the allowed work arrangements.

Term	Definition
Advanced Fatigue Management (AFM)	An option introduced in the 2008 legislation that enabled an NHVAS accredited Operator to propose a trip plan for which they believed the risk associated with increased likelihood of fatigue due to longer working times had been adequately offset or mitigated by additional risk controls. The original AFM, which was introduced as part of the Model Law did not have any guidelines over what fatigue risks would be associated with particular schedules. The proposed AFM, to be introduced via the HVNL, provides some guide to fatigue risk by including a Risk Classification Matrix.
Basic Fatigue Management (BFM)	An option introduced in the 2008 legislation that specified a discrete set of exceptions (e.g. up to a 14h of work) and detailed the specified controls required to mitigate the risk associated with the increased likelihood of fatigue associated with the extended hours.
Circadian Rhythm	Also known as the body clock: a naturally occurring 24 hour cycle influenced by light that influences periods of wake and sleep. There is an increase in the desire to sleep at night, and a decrease in the desire to sleep during the day.
Council of Australian Governments (COAG):	An organisation consisting of the federal government, state and territory governments and local government.
FAID	FAID is a bio-mathematical model (BMM) that is used in some transport sectors to determine the likely fatigue risk associated with a roster schedule.
Fatigue Assessment Panel (FAP)	A group of jurisdictional delegates that made recommendations on the approval of AFM applications under the original scheme.

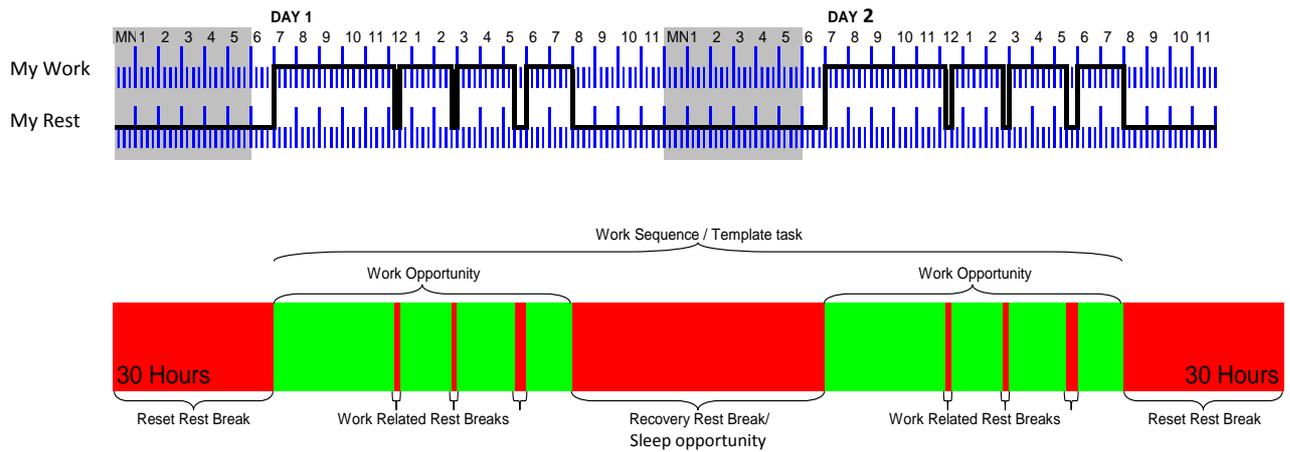
Independent Expert Panel (IEP)	An independent group appointed by the NTC to provide evidenced-based recommendations of policy issues.
Fatigue Expert Reference Group (FERG)	A panel of fatigue experts, industry representatives and jurisdictional representatives that will convene to make recommendations to the NHVR regarding the approval of AFM applications in the proposed legislation.
Fatigue Risk Score	A score obtained by comparing a proposed work schedule to the Risk Classification Matrix. Higher scores reflect higher estimates of fatigue related risk associated with that schedule.
Heavy Vehicle National Law (HVNL)	The <i>Heavy Vehicle National Law Act 2012</i> and amendments proclaimed by the Queensland Government and used as a template to implement similar legislation across Australia
Heavy Vehicle Driver Fatigue (HVDF)	The reform to implement the <i>Road Transport Reform (Heavy Vehicle Driver Fatigue Act) Regulation 2007</i> .
National Heavy Vehicle Regulator (NHVR)	A national body that governs and administers national heavy vehicle regulation, driver compliance and enforcement services, including AFM.
Performance-based	Approaches to fatigue management available under AFM where Operators can develop specific schedules that are not provided for under the prescriptive limits of Standard hours and BFM provided they can demonstrate that their work schedules are 'safe'.
Recovery break	A recovery break is a rest between work opportunities that allows the driver to sleep (that is, they are sleep opportunities). These are breaks that are longer than 7 hrs but less than 30 hrs. This is outlined in Figure 1 .
Recovery rest breaks	
Rest:	Rest is any period of non-work within a work opportunity. This is outlined in Figure 1 .
Reset break:	A reset break is any break longer than 30 hours which contains two night rests (rest between the hours of midnight and 6am). This is outlined in Figure 1 .
Risk Classification System (RCS)	A tool to be used to assist in the assessment of AFM applications. RCS allocates a Fatigue Risk Score to a pattern of work and rest. It is based on fatigue science and contains seven principles to be assessed. These principles are described in a matrix with work and rest

	arrangements ranked according to relative fatigue risk likelihood and a score of 0 – 3 assigned.
Risk Score	The sum of risk category scores for a particular task. The risk score is an overall indicator of fatigue risks associated with a specific task.
Risk Trading	This refers to the notion that the elevated fatigue risk associated with high risk practices (i.e. long work opportunities) can be offset by adopting low risk practices (longer or more frequent breaks).
Safety Case	The document prepared by an AFM applicant to support the assessment of their AFM application. It would accompany the completed RCS and provide an outline of how risk is to be managed for the schedule proposed particularly commenting on any areas of high risk and proposed mitigations. It is expected that these documents would be around 2 – 4 pages in length.
Shift	A period of work between major rest opportunities. This broadly equates to a work opportunity under AFM.
Sleep Opportunity (SO)	Opportunities for a driver to sleep which may occur with either a recovery or reset break. This is outlined in Figure 1 .
Standard Hours	Work and rest limits set out in the 2008 legislation and available to all heavy vehicle Operators.
Task	The work sequence planned for a particular activity for a particular point in time. Identification of tasks will assist in developing countermeasures for the anticipated level of fatigue risk for a particular job.
Work	In the Heavy Vehicle National Law (HVNL) work is defined as driving a fatigue-regulated heavy vehicle as well as related tasks including (but not restricted to) instructing another person to drive a heavy vehicle, loading and unloading, refuelling, inspecting and servicing the vehicle.
Work Opportunity (WO)	Work time plus work related rest or breaks between commencing and finishing work. At least a 7 hour break is necessary to signify the end of a work opportunity. This is outlined in Figure 1 .
Work-related rest breaks	Short rest breaks taken within a work opportunity will delay onset of fatigue impairment.

Work Sequence	A series of work opportunities and recovery rest breaks between reset rest breaks.
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Figure 1, below illustrates key terms used in the RCS matrix relative to an extract from the sample work diary page. Explanation of the key terms follows.

Figure 1 – Depiction of key terms in the Risk Classification System



It is important to note that work and work opportunity are not interchangeable terms. The inclusion of work and work related rest breaks together may make a work opportunity appear longer than work periods specified in current AFM tables. This is not the case, as the combination of work and short rest breaks in the current AFM arrangement is equivalent to the current proposed maximum work opportunity.



3 NHVR Consultation

The HVNL proposed the continuation of the outer limit of 16 hours as originally contained in the Model Law. The IEP, whilst finding that the 16 hour outer limit was supportable provided there were sufficient checks and balances, recommended that 'rather than focussing on a single number as the outer limit for driving hours under AFM, a more comprehensive approach to fatigue risk management is adopted and that the NHVR Project be requested to develop this further in consultation with industry'.¹ The RCS developed by IEP implied an outer limit of 17 hours work opportunity (work and related rest breaks). As previously outlined SCOTI accepted the IEP report and recommendations as long as sound evidence was provided that there would be no increase in fatigue-related risk by changing the maximum work hours from 15 hours in a 24 hour period, as implemented in NSW, to a 17 hour work opportunity.

In response to the IEP report and the subsequent SCOTI decision, the NHVR undertook a series of consultations with industry and jurisdictions during 2012 in relation to:

- the proposed RCS and its operation as part of a revised AFM.
- scientific evidence in relation to an outer limit.

Drew Dawson and Ann Williamson, university based fatigue experts who were also members of the IEP, were engaged by the NHVR as part of this process. A scientific Evidence Statement to examine the appropriateness of the seven principles underpinning the RCS was produced. The RCS Evidence Statement can be found on the NHVR website.

In addition a Peer Review Panel comprising the following representatives was convened:

- Professor Narelle Haworth - CARRS-Q. Background in Australian trucking research.
- Dr Phillip Swann – Road Safety Manager at VicRoads. Background in driving impairment and safety.
- Melanie Cosgrove - NatRoad representative and Fleet Compliance Manager at SRV Road Freight Services. Background in trucking industry and AFM operator.

The purpose of the Peer Review Panel was to review the scientific evidence on which recommendations relating to AFM and the RCS were based. All members of the Peer Review Panel signed off on the Evidence Statement and its applicability and use to AFM. One member made a dissenting report raising areas of concern primarily related to lack of research and the implications for assessing AFM risk.

A series of one-on-one engagements and meetings, two rounds of formal consultation with industry and jurisdictional stakeholders were undertaken involving the distribution of draft:

- AFM Evidence Statement.

¹ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 2

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- Risk Classification Matrix.
 - AFM Business Rules.

This document takes into account the feedback received through the series of meetings and submissions during 2012 as well as the fatigue research and review that has been undertaken.

4 Background to Fatigue Regulation

The regulation of driving hours for road transport has a long history in developed countries. From the early part of the century, policy makers realised that the shift to motorised road transport carried a significant increase in the risk of accident due to fatigue. Until recently, most governments have regulated fatigue in heavy vehicle drivers using a prescriptive rule-based approach that defined:

- maximum driving times.
- minimum break times.
- limits on the number of days worked in a row and/or limits on total working hours in a set period (typically 7 or 14 day periods).

In Australia in the late 1990s it became apparent that these rules and/or their enforcement were not achieving their stated goal of reducing fatigue related crashes involving heavy vehicles. In 1999 and 2000 a parliamentary enquiry into fatigue in the transportation industries *“Standing Committee on Communication, Transport and the Arts: Beyond the midnight oil: managing fatigue in transport, House of Representatives, Canberra, 9 October 2000” (Burning the Midnight Oil)* reported that there was strong evidence that fatigue-related accidents and injuries were on the increase and that there was a need to improve regulation of fatigue in order to reduce the social costs associated with fatigue-related incident and injuries.

The committee also noted that the existing system of prescriptive driving time rules and intermittent enforcement by police and roadside officials was not the only way to regulate fatigue. They suggested that it might be possible to regulate fatigue more effectively using some of the emerging principles of risk and safety management theory as had already happened in other Australian transport modalities including rail and aviation.

4.1 Moving away from a rule-based approach

Non-prescriptive approaches to safety management have developed over the last four decades in response to the Robens Committee Report (1972) in the UK. In this landmark report, Robens argued that the increasing complexity of systems of work was such that it was difficult for government to develop and enforce prescriptions and rules that managed risk in a cost-effective manner. He argued that the cost of government centred regulation and enforcement was increasing exponentially and had reached a point of diminishing returns. His report argued that the most appropriate way to regulate safety was at the firm level and that firms should be required to demonstrate how they would manage risk by developing a ‘safety case’ that would be approved by the regulator. From this perspective, individual organisations (rather than regulators) would be required to identify and determine the controls necessary to mitigate the risks associated with work place hazards. Regulators on the other hand would be required only to approve an individual organisation’s hazard management plan.

The potential advantages of this approach as identified by Robens were:

- increased flexibility in how best to manage the local hazard profile effectively.
- reduced costs associated with managing the hazard at the local firm or work place level.
- reduced cost of compliance and a transfer of compliance monitoring to the organisation.

This approach received broad based support from employers and government and was rapidly adopted across much of the English-speaking world. By the mid-1990s performance based approaches to Occupational Health and Safety (OH&S) legislation had been implemented in all Australian jurisdictions.

While performance based approaches to safety regulation have become widely accepted for OH&S agencies in Australia over the last two decades, the shift in regulatory perspective has been less pervasive in non-OH&S agencies responsible for managing safety issues under other legislation (e.g. aviation, rail, maritime, mining and roads transport). There is no simple reason to explain this difference in approach to safety, which have been adopted across different regulatory agencies in Australia. It has been suggested that the more prescriptive approach has continued to varying degrees in the transport sector due to factors such as:

- a desire amongst industry members for clear guidelines for accreditation.
- the bureaucratic separation of other regulatory agencies from mainstream OH&S.
- political and regulatory conservatism due to the high public profile of accidents in these industries.
- scepticism over the benefits of performance-based safety as a ‘philosophy.’
- high level of union membership in these industries resulting in traditional industrial agreements, which are typically rules-based, being favoured in the regulation of working time arrangements.

4.2 Performance-based approaches in the transport sector

Burning the Midnight Oil recommended that there was considerable merit in moving toward a more flexible approach to regulating fatigue related risk. The committee noted the potential benefits of using a framework that was consistent with Australian standards for risk and safety management (AS4360/4801).

There have been some modest shifts toward more performance based approaches to managing fatigue related risk in the road transport sector over the last 20 years. Performance based approaches to fatigue management, on which the original AFM as outlined in the HVDF is based, allows transport operators to propose a unique schedule of work and rest on the basis of its overall systemic safety. This move towards more performance based approaches has also been evident in other transport modes.

For example, in the mid-1990s the Civil Aviation Safety Authority (CASA) pioneered non-prescriptive approaches to fatigue risk management and introduced a hybrid system of fatigue regulation in which the long standing prescriptive rule set (CAO-48) formed the basis of fatigue regulation. However, CASA recognised that a single rule set was unlikely to provide the necessary flexibility for the whole industry and introduced an alternate compliance

option. For operators who wanted to operate outside the rule set of CAO-48 there was the opportunity to present a safety case (formally a Fatigue Risk Management System) demonstrating how the operator intended to manage the risks to an equivalent or lower level of risk.

CASA formally evaluated this system (McCulloch, Fletcher, & Dawson, 2003) using a case study method for the first 80 organisations to apply for and receive an exemption to CAO-48. In this review the authors reported a high degree of industry satisfaction with the process but noted that delays in approval and lack of regulatory resources had made it difficult for some operators to get an FRMS into place quickly and efficiently. The authors also noted that although there was no evidence that the system was less safe in the operator sample to date, given the very low frequency of adverse events in the industry it was premature to conclude that the new approach was demonstrably equivalent or safer.

A similar approach was developed by the rail industry in Australia in the early 2000s. The rail industry differed significantly from aviation in that regulation was state-based and each of the jurisdictions took a slightly different approach. The key feature of the changes in rail was the introduction of two overlapping assessment systems. Most of the state-based rail safety regulators, in conjunction with operators and unions, developed an ad-hoc approach based on a hybrid application of rule-based compliance overlaid by a risk based analysis using bio-mathematical models (BMMs). In simple terms, these models estimate the likely sleep/wake patterns and resultant fatigue associated with a pattern of work. These predictive algorithms were developed using very large data sets collected from train drivers in the period 1996-2000.

The most widely used tool of this kind was the FAID software system (<http://www.faidsafe.com>). Rail operators and regulators used these software tools to model proposed and actual rosters. The BMMs were typically used in two ways. First, where the permitted roster (based on industrial agreement) produced estimated average fatigue scores over an agreed threshold value (typically FAID 80) the roster would be reviewed and reconstructed so that it was consistent with both the industrial agreement and the fatigue analysis. The goal of this analysis was to try to reduce the likelihood of permitted but unsafe working time arrangements. Second, where a new working time arrangement was proposed as part of an EBA negotiation, operators would typically undertake an analysis using a BMM to demonstrate that the proposed working time arrangement, while not permitted under the current industrial agreement, was unlikely to increase fatigue related risk.

There was some degree of variability across jurisdictions in the way this approach was implemented but there was also significant consistency. In general, limits on maximum shift lengths and minimum break durations remained limited by industrial agreements. The way in which shifts could be organised into sequences or patterns over time was significantly influenced by the BMM analyses. It is of note that BMM analysis, whilst useful, has limitations, in particular it cannot consider an individual's level of fatigue nor can they fully assess the overall risk context of a particular operation.

In general, the combined approach resulted in a clear shift toward a risk based approach by regulators. Operators were increasingly required to assess the likelihood of fatigue and the

consequences of a fatigue related error associated with a pattern of work in a scientifically defensible manner at the systems level. This represented a significant shift away from the singular use of rule sets derived from industrial agreements with little scientific defensibility and where safety considerations were often over-ridden by factors related to operational cost/convenience, employee income and/or quality of life.

4.3 The development of risk-based approaches in the road transport industry

In parallel with the changes in aviation and rail, the road transport industry also started to explore the opportunity for more flexible risk and safety management based approaches. Risk based approaches involve identifying the fatigue related risks and developing defences against these risks.

Fatigue expert groups were first convened in late 1999 and worked over the next 5-6 years to try and develop a new approach that was more consistent with the recommendations for policy architecture made by the parliamentary enquiry. While there was general agreement that the existing policy architecture was not ideal and risk based approaches held considerable promise, there was concern that the current safety culture and infrastructure within the road transport industry was considerably less experienced with risk based approaches than in the rail and aviation sectors.

While some of the industry and scientific experts were persuaded that the larger, better resourced operators and regulators could effectively implement more flexible approaches, there was a concern that the large number of small poorly resourced operators and some regulators might be less able to develop the appropriate risk mitigations and enforcement policies required in a more flexible policy environment.

There was significant concern that a rapid shift toward performance-based regulation could result in inadvertent *de facto* fatigue deregulation for a large section of the industry. Additionally, the safety risk posed to other road users by heavy vehicles in a road incident due to their size and weight, has also been a factor in continued favour of prescriptive based approaches.

The policy reforms introduced in the 2008 model fatigue law were aligned with the risk based approach taken under occupational health and safety laws and mirrored the changes in aviation and rail in that they acknowledged the fundamental problem of developing a universal rule set that was scientifically and legally defensible for all operators and circumstances. As with the other industries, a hybrid approach was implemented whereby a simple rule set was developed as well as two schemes which provided greater flexibility and access for operators with established sound fatigue management practices.

4.3.1 Standard Hours

Standard Hours sets work and rest limits which were intended to be easy to comply with and enforce. It was anticipated that Standard Hours would be sufficient for most Operators under most situations. As an outer limit, the Standard Hours option stated that solo drivers must not work for more than a maximum of 12 hours in one shift with at least 7 hours continuous

rest following and preceding this. In this legislation, work was defined as driving as well as all other tasks that related to the operation of a heavy vehicle. This definition of work excluded rest breaks. This was directly comparable with the rule sets developed by CASA (CAO-48) and Schedule II of the Rail Safety Act in NSW.

4.3.2 Basic Fatigue Management

BFM provides the opportunity for longer work hours than Standard Hours (e.g. up to a 14hrs of work with other limits such as on night work) and detailed the specified controls required to mitigate the risk associated with the increased likelihood of fatigue associated with the extended hours. The purpose of BFM was to allow for more flexible work and rest hours provided the operator demonstrated a range of standards had been met. To access BFM, transport operators needed to be accredited in NHVAS and comply with 6 BFM standards covering scheduling and rostering, fitness for duty, fatigue knowledge and awareness, responsibilities, internal review, and records and documentation.

4.3.3 Advanced Fatigue Management

In principle, AFM enabled an NHVAS accredited Operator to propose a trip plan for which they believed the risk associated with longer working times had been adequately offset or mitigated by additional risk controls. Operators were required to develop a specific organisational safety case for approval. The system was to allow for flexibility in work schedules while still operating within a prescriptive outer limit of 16 hours in a 24 hour period. At the time of the policy reforms it was expected that a significant number of operators would take advantage of this option. This gave an avenue for operators whose current schedules were precluded by the new Standard Hour's regulations to apply for permission to continue working these schedules. Like BFM, AFM adopted a 'standards' approach with 10 AFM standards that must be met in order for accreditation. These included scheduling and rostering, readiness for duty, fatigue knowledge and awareness, responsibilities, internal review, records and documentation, health, workplace conditions, management practices, and operating limits.

This regulatory reform process also introduced a series of administrative reforms around record keeping, enforcement requirements, operator reporting and general safety compliance. Importantly, it tightened the definitions for work and driving time to include non-driving work related activities such as loading in the definition of work. These changes provided the rationale for the significant level of risk reduction required to permit the extension of hours under controlled circumstances (e.g. BFM and AFM). A significant number of operators have accessed the BFM program with a smaller cohort (~23 at time of writing) operating under AFM approvals.

4.4 Adoption of the National model fatigue law 2008

States and Territory governments varied the Model law to reflect local concerns during implementation. These variations are outlined in the following paragraphs.

4.4.1 National model fatigue law 2008 – NSW and Vic version

The provisions relating to Standard Hours and BFM in the Model Law were implemented in NSW and Victoria. In most regards, NSW and Victoria also implemented the AFM policy as outlined in the national model with one exception; in these two jurisdictions the maximum hours of work in any 24 hour period was 15 hours.

4.4.2 National model fatigue law 2008 – QLD and SA version

The Standard Hours, BFM and AFM were all implemented in Queensland and South Australia in line with the national model. These jurisdictions implemented a 16 hour in 24 hours maximum outer limit.

4.4.3 Jurisdictions who did not go with the Model Law

Western Australia implemented an Occupational Health and Safety approach to fatigue management. All operators in WA were subject to the laws and are obliged to have fatigue management procedures in place that could be checked at any time. The WA regulations require a minimum of 7 hours rest within a 24 hour period. This maximum allowable 17 hours of work opportunity in a 24 hour period includes short rest breaks.

In Tasmania, heavy vehicle drivers operate under a system called the Driving Hours Record. This system introduced legislation around record keeping and logbooks, while keeping the legal limits on driving that had existed in that state since 1996. These work hours include 12 hours maximum driving within a 24 hour period, with a maximum of 14 hours working time per 24 hours. Drivers in Tasmania are required to take a rest break of at least 30 minutes before the completion of 5 hours and 30 minutes, which can be broken up into two 15 minute blocks.

The Northern Territory developed a Road Transport Fatigue Management Code of Practice under the provisions of the NT Workplace Health and Safety Act. The NT model follows that of Western Australia, except in the NT adherence to the legislation is voluntary and the onus is on the Operator to prove that their systems of work have met their OH&S obligations. With regards to work hours and break hours, the responsibility is on the driver to operate within their limits and to stop and take a rest when they themselves decide they need it, rather than being bound by prescriptive driving/working hours. As a guideline, the NT states that drivers need to take two periods each of at least 24 hours rest in a 14 day period and at least 6 hours rest in any 24 hour period. This exceeds the limit imposed by the national legislation of an outer limit of 16 hours in 24 hours.

5 Risk Classification System

The IEP in their report embraced the concept of performance based risk assessment but acknowledged that the open ended approach implicit in the previous AFM scheme was flawed in that it created considerable administrative burden and cost on operators with little transparency of decision making. In settling on the RCS the intention was to promote the concept of a performance based risk assessment (therefore assessing cases on their merit) whilst providing guidance through the RCS.

*'The new approach will be achieved through the use of the simple risk trading principles and classification system. An application to operate outside the Standard Hours boundaries will require the applicant to identify the increased risks associated with the proposed changes to driving hours and the proposed countermeasures (risk offsets) that would be introduced to ensure an equivalent or reduced net risk to the system. Countermeasures might include increased sleep opportunity before and/or after long shifts or changing the time of day of work, etc.'*²

The development of the RCS was expected to provide:

- a framework within which applications could be developed and assessed decreasing the administrative burden involved in application development and assessment.
- a transparent risk assessment tool that enabled operators and the regulators to assess overall net risk.

The RCS identifies and numerically weights the key fatigue risk factors in a proposed AFM work schedule. The fatigue likelihood 'score' derived from the RCS matrix enables operators and regulators to identify where and to what extent a pattern of work increases and decreases the overall likelihood of fatigue. By assessing across all seven sub-dimensions of the work schedule it is possible to derive a more balanced judgment of the *net relative likelihood* of fatigue. The score derived from the RCS has led many stakeholders to believe that this is a new set of prescriptive rules and limits for AFM. This was not the intention of the IEP nor is it proposed to be implemented under the HVNL in this manner. The RCS is a guidance tool not a prescriptive assessment device and in assessing the application the NHVR will weigh the matrix score along with other information provided on mitigating factors and safety approach relevant to the schedule.

By necessity, a likelihood assessment methodology must balance the simplicity required of an assessment tool against the considerable complexities of fatigue science. This inevitably requires trade-offs and some degree of uncertainty. Despite this, the weight of evidence, as outlined in RCS Evidence Statement, would suggest that the proposed methodology has strong scientific validity. This represents a significant improvement over the current approach which provided little direction for either applicants or regulators in assessing fatigue risk of proposed AFM work schedules.

² Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 6

5.1 Three Dimensions and Seven Principles of the RCS

Fatigue is a complex issue with multiple causes. The IEP drew on research and evidence to develop three key dimensions in the RCS which were further broken down into seven principles.

- **Dimension 1 – Work Related Rest Breaks** - breaks from driving within work opportunity to reduce performance impairment due to extended time-on-task
 - Reduce the time spent continuously working in the work opportunity.
 - The more frequent breaks from driving the better.
- **Dimension 2 – Recovery Breaks** - sleep opportunities between work opportunities to provide enough time to obtain sufficient sleep in order to reduce the likelihood of unsafe levels of fatigue
 - Provide an adequate sleep opportunity in order to obtain sufficient sleep.
 - Maximise adequate night sleep.
 - Minimise shifts ending between 00:00 to 06:00h.
 - Minimise extended shifts.
- **Dimension 3 – Reset Breaks** - breaks in sequences of Work Opportunity to reduce the likelihood of build-up of unsafe levels of fatigue over an extended sequence of shifts
 - Reduce the accumulation of fatigue with Reset breaks at least 30hrs and including two night periods, 00:00-06:00)between work sequences.

The following sections outline the rationale behind the three dimensions and seven principles. Details of the research to support the statements and more in depth discussion on the dimensions and principles are found in the RCS Evidence Statement available on the NHVR website.

5.1.1 Dimension 1: Rest breaks

One of the most important determinants of fatigue is 'time on task'. Humans are not good at long duration vigilance tasks (e.g. driving).

Over the last 30 years a significant body of research indicates that performance consistently declines once the time spent continuously driving increases beyond two hours and that it is difficult for a driver to maintain a safe level of vigilance for more than 4.5-5h of continuous driving. The greater the frequency and duration of breaks across the shift, the less time a driver will spend continuously 'on task' and the less likely they will be to exhibit fatigue related impairment due to 'time on task'.

Driving tasks that are frequently interrupted by non-driving activities (e.g. loading, customer interactions etc.) will reduce periods of continuous driving. Research has found that one of the most powerful ways to reduce the build-up of fatigue is to increase the frequency of breaks so as to minimize continuous driving time.

It is important to note that breaks here are not only those implied by industrial agreements (e.g. smoko's and meal breaks) although these do serve to break up task duration. The likelihood of fatigue can also be reduced during the work period by breaks or task rotations/substitutions that reduce continuous driving time.

The shorter the periods of continuous driving are, the less likely it is that fatigue will accumulate across the shift. To determine the increase in the likelihood of fatigue this dimension is subdivided into two sub-dimensions the percentage of time spent driving and the length of the longest continuous time spent driving.

5.1.2 Dimension 2: Recovery breaks

The Recovery Break dimension consists of four sub-dimensions that assess the likelihood of fatigue based on the circadian timing and duration of shifts and breaks

When an individual starts work they need to be sufficiently rested so as to be able to sustain their work activities over the designated duration of the next shift. To work safely across a given shift and to then return to work sufficiently recovered to work the next shift requires an employee to obtain sufficient sleep between shifts. The first principle in this dimension therefore focuses on sleep opportunities.

Most regulatory approaches to fatigue have focused primarily on shift and break duration. Fatigue expert advice is that whilst the introduction of the concept of night work in the 2008 Model Law was a good first step, it did not sufficiently acknowledge the critical role that circadian timing plays in the rate at which fatigue accumulates and the rate at which people recover.

The risk assessment score increases as the length of a shift increases and more so where it finishes during the primary circadian low in alertness (i.e. midnight to dawn). Similarly, the likelihood of fatigue increases as the recovery breaks decrease in duration especially where the breaks occur during the normal circadian low for sleepiness (i.e. dawn til midnight).

5.1.3 Dimension 3: Reset breaks

While recovery breaks between shifts can theoretically provide an adequate opportunity to obtain sufficient sleep, in practice the research literature indicates that there is often an increase in fatigue (and fatigue-related risk) that accumulates across subsequent shifts. This has been referred to in the lay literature as a 'cumulative sleep debt'.

Sequences of shifts are usually separated by a sleep opportunity that permits at least two sleep periods at night and a day without work in between. These have been referred to as the 'Reset Break' and broadly correspond to the weekend in normal work cycle. Reset Breaks are typically 30 or more hours in duration.

There is a significant scientific literature that indicates that a Reset Break (i.e. at least two night sleeps with a day off in between) provide an adequate opportunity to reverse the sleep debt typically accumulated across a sequence of shifts. This reset break effectively reduces the fatigue levels to zero.

Principles	Baseline (Score=0)	Low fatigue likelihood/safety risk (Score = 1)	Medium fatigue likelihood/safety risk (Score = 2)	High fatigue likelihood/safety risk (Score = 3)
Work-related Rest breaks: breaks from driving within work opportunity (WO) to reduce performance impairment due to extended time-on-task				
1. Reduce the time spent continuously working in the WO	>20% of time in the WO	>15-20% time in the WO	>10-15% time in WO	6-10% time in WO ³
2. The more frequent breaks from driving the better	≥ 15 mins in every 2 hrs	≥ 15 mins in every 3 hr	≥ 15 mins in every 4 hr	≥ 15 mins in every 5 hr
Recovery breaks: sleep opportunities between work opportunities (WO's) to ensure sufficient time to obtain sufficient sleep to prevent unsafe levels of fatigue				
3. Ensure an adequate sleep opportunity (SO) in order to obtain sufficient sleep	Recovery breaks ≥ 12 hrs	Recovery breaks > 9hrs	Recovery breaks >8-9hrs	Recovery breaks 7-8hrs
4. Maximise adequate night sleep	All Recovery breaks include 23:00 to 07:00 period	All Recovery breaks include 00:00 to 06:00 period	More than half of Recovery breaks include 00:00 to 06:00 period	Less than half of Recovery breaks include 00:00 to 06:00 period
5. Minimise shifts ending between 00:00 to 06:00h	No WO's end in 23:00 to 07:00 period	No WO's end in 00:00 to 06:00 period	Less than half of WO's end in 00:00 to 06:00 period	More than half of WO's end in 00:00 to 06:00 period
6. Minimise extended shifts	<12 hours WO between Recovery breaks	<13 hour WO between Recovery breaks	13 - 14 hour WO between Recovery breaks	> 14-17 hour WO between Recovery breaks
Reset breaks: breaks in sequences of WO to eliminate the build-up of unsafe levels of fatigue over an extended sequence of shifts				
7. Prevent accumulation of fatigue with Reset breaks at least 30hrs and including two night periods, 00:00-06:00)between work sequences	≤ 2 days (48hrs) between Reset breaks	≤3 days (72 hrs) between Reset breaks	≤7 days (≤168 hrs) between Reset breaks	>7 days to 12 days (> 168 - 288hrs) between Reset breaks

³ This parameter is limited by the outer limit of a 17 hour work opportunity with a minimum of 1.5 hours work related rest breaks. Therefore a lower percentage of 6% for work related rest breaks only applies to work opportunities of less than 17 hours.

5.2 Stakeholder Feedback on the RCS Evidence Base

As has been noted several times in this document, fatigue management is not an exact science and the RCS, whilst based on best available evidence, is not definitive. Whilst accepting the inexact nature of fatigue a number of stakeholders have questioned the evidence presented. This section discusses areas of key concern which have been raised by stakeholders.

A number of published documents, including those relating to insurance claims, have noted that the peak crash risk period is between 11am and 2pm and not the midnight to 6am period highlighted as high risk in the RCS. An important factor in considering risk is not just the raw number of crashes but the number of crashes as a function of the number of vehicles on the road. The reported finding that the raw number of crashes is higher in the 11am – 2pm timeslot is not disputed however evidence has found that when figures are volume adjusted, the early hours of the morning are the peak crash time.

Some stakeholders expressed concern that much of the evidence cited was from overseas and not Australian sources. The paucity of scientific peer-reviewed studies on fatigue in Australia is acknowledged. The evidence statement has been based on scientific literature which has had the rigour of peer review and has not utilised less rigorous work as the quality of this is not known. Wherever available, appropriate Australian studies have been included.

Stakeholders referred to the 2011 Major Accident Investigation Report published by the National Truck Accident Research Centre, which demonstrates that heavy vehicle crashes are most likely occur in the early outward bound stages of a journey. This suggests that fitness for duty is perhaps of greater influence in fatigue related accidents than the overall length of time behind the wheel. The importance of fitness for work is acknowledged and it is this which has driven the RCS to focus on ensuring adequate breaks including recovery and reset breaks. It is acknowledged that providing a rest opportunity does not guarantee a restorative rest is achieved. The RCS provides likelihood score however individual circumstances will always influence the level of fatigue experienced by a driver, highlighting the importance of the legislative provision that a driver must assess their own fitness to drive and not do so when fatigued.

The relative value of different rest types has been raised by some stakeholders as a matter which should be taken in to account in the RCS eg:

- rest at home versus rest at a motel.
- a short rest on the side of the road versus at a roadhouse with facilities such as showers and food.

The difference in experience for drivers of varying rest opportunities is acknowledged and consideration of these factors would appropriately be considered when developing a driver's trip schedule. The benefit of maximising the opportunity for rest in surroundings which are conducive to rest are acknowledged. The RCS is a guidance tool and as such it is not intended to be definitive nor can it take in to account the myriad of complexities associated



with individual schedules, routes taken and personal circumstances of drivers; to attempt to do so would make the tool almost impossible to use and evaluate.

6 Examples of Potential AFM arrangements

AFM is intended to be accessed by Operators who wish to undertake work arrangements which cannot be accommodated within Standard Hours or BFM. Operators have outlined a number of work arrangements which they consider to be safe which are not permitted under either Standard Hours or BFM.

As outlined earlier there is no absolute maximum score at which point an AFM application would not be considered.

These examples are indicative only; in particular more information on rest breaks proposed to be taken within these schedules would be required to undertake a full assessment.

6.1 Example 1

A meat processing facility and livestock operator want an arrangement to allow deliveries on a fortnightly schedule, twelve (12) days on with (2) two consecutive days off. Using the RCS matrix they identify that this is a high risk, so plan to compensate for this high risk by agreeing to:

- only work/accept deliveries during the day.
- work 12 hour shifts maximum; and
- not allow drivers to work for more than three (3) hours in a row.

This last arrangement works well as it aligns with the animal welfare code for transport cattle, so allows the operator and drivers to minimise disruptions in the journey. In addition to these hours based countermeasures, the processing facility agrees to ensure that the holding yard is ready and staffed for deliveries to minimise unloading delays and both parties agree to open communications when unforeseen events occur and through regular meetings to discuss/review previous issues.

6.2 Example 2

A line haul operator based in Adelaide, with a depot in Perth, is faced with two challenges. Firstly, she is increasingly aware that trips to and from Sydney are taking longer than the 14 hours her drivers are allowed under BFM due to congestion and delays. Secondly, she is finding managing two fatigue systems, BFM and WAHVA, complex especially the way she has to run two pools of drivers independently from one another. She would like to have a single set of driving arrangements for her drivers that would allow her to do the Adelaide - Sydney run safely and compliantly.

Using the RCS she develops an arrangement that matches AFM up to the WAHVA hours, offering work opportunities of up to seventeen (17) hours with a minimum continuous rest of seven (7) hours. She proposes that the schedule allow 45 hours of work opportunity in a 72 hour period, meaning that 17 hour work opportunities are available on consecutive days.

She plans to counter the high risks associated with the long work opportunity and short sleep opportunity by:

- having driver rest during the midnight to 6 am period when they are on duty.
- giving drivers regular breaks of two consecutive nights (between midnight at 6am); and
- not allowing drivers to work for more than three (3) hours in a row.

6.3 Example 3

A general freight operator has contracts to cart goods around Sydney, including trips between Goulburn and Quirindi. To help manage his drivers' fatigue, he schedules them to work the outward leg in the afternoon, finishing before midnight (3pm to 12am) and the return leg starting the next morning at 7am.

Due to the prescriptive 24 hour work requirement, drivers must pull up at Hawkesbury River before midday to make sure they don't exceed their work limit. This means that when the trip is resumed at 3pm. the drivers are now travelling through Sydney in peak hour traffic and take longer to get back to their base. Typically, drivers get back to the depot around 8pm which is too late for the vehicle to turn around for the next trip that day.

He wants to create a schedule that allows his drivers to continue driving through Hawkesbury River and return to the depot in time for the vehicles to be turned around for a second shift. Using the RCS, he proposes a schedule of two (2) consecutive ten (10) hour shifts, with a seven (7) hour recovery rest between them. He offsets the high risk associated with the short recovery rest by:

- providing extra time in the work opportunity for drivers to rest.
- not allowing drivers to work for more than three (3) hours in a row.
- having longer recovery rests on subsequent nights; and
- having drivers rest during the midnight to 6 am period.

Under this arrangement, his accreditation would allow drivers to bypass Hawkesbury River altogether and continue straight back to the depot, saving over 4 hours in journey time, allowing the drivers to get home earlier and increasing their opportunity for sleep at home that night. He will also save on vehicle operating costs and reduce the down time between journeys as the vehicle can now be turned around for another journey on the same day that it finishes its previous journey.

7 Outer Limit

The IEP considered that the Model Law which proposed a 16 hour outer limit was 'supportable, but only if there are effective risk management and oversight systems in place'.⁴ The IEP recommended that rather than focussing on a single number as the outer limit for driving hours under AFM, a more comprehensive approach to fatigue risk management was adopted.

The issue of an outer limit which the IEP was asked to address revolved around the upper limit of 17 hours allowed in WA versus the 15 or 16 hour upper limit provided for on the east coast. Differences between jurisdictions were in part semantic. The upper shift duration of 17h in WA includes a minimum of 1 hour and 10 minutes break time resulting in an effective maximum working time of 15.8h. The east coast terminology was exclusive of break times and resulted in upper maximums of work time of 15 and 16h respectively.

The IEP proposed a new terminology of 'Work Opportunity'. This terminology was not defined in the IEP report however in consultation with members has been determined to include all driving time, all non-driving work-related activities and intra-shift rest breaks (smoko, meals etc.) where a driver was unlikely to obtain sleep. The commonly used term of 'shift' is equivalent to that of a Work Opportunity. It is therefore broader than the term 'work' defined in the Model Law as it encompasses short breaks taken during a shift.

The scientific evidence indicates that extensions in driving hours are likely to be associated with higher levels of fatigue. The IEP report examined the concept of risk mitigation strategies and counter measures to offset higher risk elements of a work schedule, thus enabling work beyond a 12 hr work period and it is this that led to the development of the RCS which is discussed in more detail at Section 4.

The fatigue experts engaged by the NHVR considered the issue of an outer limit and concluded that a 17 hour work opportunity was an appropriate upper limit. This limit was determined based on consideration of the research and of current limits which have been applied in Australia. There is no safe outer limit under which no fatigue risk can be assured – rather it is the combination of factors in an overall risk environment and as the length of work opportunity increases so too does the need for mitigating risk management. Examples of mitigations would be ensuring drivers are rested before and after long work opportunities and planning long work opportunities around day work rather than night work which involves greater fatigue.

A minimum sleep opportunity of 7 hour is required before the commencement of work. This is based on research which has found that a minimum of 6 hours sleep is required to provide a suitable recovery break (see the Evidence Statement on the NHVR website) and it was considered that a 7 hour window would support 6 hours of actual sleep. Again, work arrangements involving limited sleep opportunities would require other risk mitigation.

⁴ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 4



The 17 hour work opportunity outer limit needs to be considered in the context of the overall performance based approach to risk management which is the underpinning of AFM – therefore in working to this outer limit the operator must also demonstrate a range of other mitigating strategies to reduce overall fatigue risk. One of the areas which will be assessed is the frequency of reset rest breaks – therefore breaks of 30 hours or more including two night rests. These breaks effectively reset cumulative fatigue to zero and it is the balance of these sleep opportunities along with recovery rests and other short breaks that is important in considering fatigue risk. The RCS provides a tool to assess the relative likelihood of fatigue taking into account off operating factors not just the outer limit.

It has therefore been determined that an outer limit of 17 hours work opportunity with a minimum of 1.5 hours rest breaks in this period, is the outer limit that will apply in the assessment of AFM applications under the HVNL. This results in a maximum of 15.5 hours work which is similar to the outer limit in Western Australia, 30 minutes more than currently allowed in NSW and Vic and 30 minutes less than currently allowed in South Australia and Queensland.

8 Operation of the RCS

This section outlines issues associated with the operation of the RCS in the development of applications for AFM and assessment and management by the NHVR.

Specific issues covered include:

- AFM applications.
- referral to the FERG.
- quantification in the RCS.
- mitigating Risk Strategies.
- enforcement.
- flexibility.

8.1 AFM Applications

There are two key steps involved in AFM approval:

- accreditation against the 10 AFM standards under NHVAS.
- approval of work arrangements after consideration of both the:
 - relative risks of work and rest arrangements using the RCS to make this assessment.
 - Safety case where required.

As the arrangements for accreditation under the 10 AFM standards have not changed they are not focused on further in this policy paper. It is noted that Standard 10 will need to be updated to reflect the revised arrangements; however the fundamental approach to NHVAS accreditation will not alter.

The IEP addressed the limited uptake of the AFM option and the reasons for this. Stakeholders indicated that although attracted to the option of using AFM, the cost, uncertainty and extended approval times for AFM applications had limited the number of applications submitted. Some AFM applications cost more than \$20K to prepare and the approval process was slow, often taking more than 12 months. In contrast, the BFM option had been widely adopted and is considered by stakeholders to be a relatively simple and straightforward approval process.

The RCS is intended to provide a more streamlined approach to AFM application development negating the need for development of individualised applications which rely on the engagement of external expert resources. In considering this the NHVR has sought to ensure a balance between streamlining processes whilst still ensuring safe practice. The RCS is not a prescriptive set of rules but a guideline and as such completion of an RCS matrix is not considered sufficient information on which to assess more complex AFM applications.

The IEP proposed that where an AFM application was at or below the baseline risk level, equivalent to that of operating under Standard hours, AFM applications should effectively be routinely approved.⁵ Whilst seeking to obtain a fatigue risk level similar to Standard hours, the IEP also found that it was open to an operator to put forward a proposal to operate beyond the baseline level provided they identified the increased risks associated with the proposed changes to work hours and the proposed countermeasures (risk offsets) that would be introduced.⁶

Determining where this level of relatively routine approval should be set has been the subject of stakeholder comment. Some have suggested that it should be no lower than the most risky work arrangements possible under Standard Hours or BFM. This is not considered appropriate – whilst some higher risk work combinations are permissible under Standard Hours or BFM these are not considered to be the norm, nor are they desirable on an on-going basis without counter measures and mitigation. This clearly reflects the reality that Standard Hours and BFM are not no or low risk options – they too require diligent and proactive management by drivers and Operators to ensure fatigue risk is managed.

Applicants proposing a work arrangement below the FERG referral threshold would not be required to provide any additional information about their work schedules beyond the completion of the RCS, although they would be able to do so if they chose to.

Applicants basing their work schedules on a published template (regardless of the RCS score level) would similarly not be required to provide additional information beyond the completion of the RCS. However, where the template was approved taking in to account mitigating arrangements not specifically provided for in the RCS these would need to be addressed by an applicant in a safety case.

Where transport operators are lodging an application over the RCS threshold and it is not based on a published template, they will be required to present a safety case. This would be a short overview of their proposed work schedules including information on how the higher risk elements of the schedule will be mitigated. The safety case would be expected to be around 2 - 4 pages in length for a basic application. Where arrangements proposed are within the category of 'baseline – high fatigue likelihood' in the RCS, no scientific evidence would be required to justify the proposal. Where applicants wish to put forward a proposal which provides for work schedules beyond those which would have been given a score of 3 in the RCS, more detailed information and evidence, where available, on the overall safety of the arrangement proposed would be expected.

8.2 Referral to FERG

The IEP proposed that where an application was over a threshold that it should be referred to an expert group. This group is to be known as the Fatigue Expert Reference Group (FERG).

⁵ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 5

⁶ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 6

The FERG will consist of 3 – 6 members with expertise in one or more of the following areas:

- fatigue
- human factors
- behavioural science

This group will have an advisory role with regard to AFM applications referred by the NHVR. The business rules provide that FERG advice must be sought where:

- Any of the proposed tasks exceed the high fatigue likelihood/safety risk specified in the RCS Matrix.
- The application contains:
 - more than two (2) high risks; or
 - two (2) high risks and any medium risks; or
 - one (1) high risk and more than two (2) medium risks; or
 - more than three (3) medium risks.
- the application is based on a published template which requires the submission of a Safety Case.
- the NHVR determines that independent fatigue expert advice will be useful in assessing the safety risks associated with the application or is seeking advice on conditions to mitigate anticipated safety risks associated with the application.

The Regulator is not required to refer an application to the FERG when the application is based on:

- a previously approved application for that Operator and the risk has not changed from the previous approval.
- a published template and conforms with requirements of that template.

Some stakeholders are of the view that the threshold level for referral to FERG is too low and will result in too many applications being considered by FERG, thus limiting the administrative efficiencies sought from the reform. Other stakeholders have expressed concern about the potential approval of higher risk work schedules without sufficient consideration and have therefore favoured higher scrutiny. FERG referral levels were set based on the advice of the two fatigue experts engaged on the IEP and who subsequently worked with the NHVR on the RCS and Evidence Statement.

This threshold for referral to FERG is relatively conservative however should be balanced against the intention to provide for published templates of work whereby referral to FERG would generally not be required. This template driven approach is expected to provide significant opportunity for smaller to medium size operators to avail themselves of AFM without the administrative effort and cost involved in developing a bespoke application. Importantly however it does not relieve them of the need to ensure risk associated with their

operations and work schedules is managed and that appropriate counter measures and systems are in place.

The threshold for referral to FERG will be subject to review by the Regulator and this review will be undertaken within 2 years of implementation of the revised arrangements.

8.3 Quantification in the RCS

As outlined, the RCS provides a score for proposed work and rest arrangements against each of the seven principles. These scores are by necessity indicative only. The scientific knowledge is not definitive. There is not yet sufficient empirical data to indicate that the relative weights assigned to each of the sub-dimensions and their respective thresholds are exactly right. Neither is it possible to accurately assess the extent to which the dimensions may interact to produce non-linear outcomes. However, this does not undermine the overall scientific evidence on which the RCS is based and general logic of the scores assigned to various work and rest arrangements. It should also be acknowledged that the RCS provides enhanced rigour and transparency over the current open ended AFM assessment process which resulted in uncertainty for applicants and potential inconsistency in how applications of similar fatigue risk were viewed.

The original RCS proposed by the IEP had three categories of relative risk for each of the seven dimensions rated from low to high risk. Each of these categories was assigned a score from 1 – 3 (low to high). Stakeholders provided feedback that the RCS as originally drafted did not have a category that effectively presented an inherently safe arrangement. It was argued that the omission of such a category did not provide for a balanced assessment of the overall fatigue risk of a proposed work schedule. In response to this feedback the RCS was adjusted to include a fourth category of baseline fatigue likelihood which was assigned a score of zero. This does not imply that any work arrangement guarantees no fatigue risk, rather that these schedules can be undertaken within normal accepted safety standards.

The IEP report provided little discussion on the issue of quantification, however noted that scores assigned were indicative only and consideration would need to be given to the relative weight of each of the principles.⁷ A number of stakeholders have commented that many of the principles are linked and that a high score on one principle almost inevitably leads to a high score on another, thus creating a cumulative effect which could be said to inflate the score and assessment of relative risk. Other stakeholders have commented that some principles are more important than others and should be given proportionally more weight.

This feedback in relation to quantification is strongly linked to argument for and against an absolute score over which an application should not be approved. In considering this issue it is important to return to the fundamental principle of AFM which is a performance based risk assessment which by its very nature is not prescriptive and rule driven. The scoring is indicative and therefore there is no proposed score over which an application will be automatically refused. That said, the higher the score the more likelihood of fatigue risk and

⁷ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 13

the more closely an application will need to be assessed in relation to risk mitigation. Whilst acknowledging the imperfection of the scoring system, emphasis needs to be on this as a tool to assist in assessing risk not a prescriptive decision making matrix.

A related issue is whether the high fatigue likelihood/safety risk category with a score of 3 is an absolute limit for a particular principle. Some stakeholders have suggested that any application which involves an arrangement beyond that envisaged in the high likelihood category should be automatically refused. This proposition was in part fuelled by the initial IEP report which described the high risk category as an 'absolute limit'. Whilst using the term of absolute limit the IEP clearly did not intend these to be an automatic basis for rejection of an application stating that 'considerations for approval could be both the total score as well as any individual characteristics which fall outside the absolute limits'.⁸ Again, the issue in assessing any AFM application is a consideration of the all of the factors that apply to a proposed work schedule and it is feasible that, in a performance based assessment, an applicant may be able to demonstrate that a package of mitigations provides a balanced approach to fatigue management. Therefore there is no absolute or upper limit in regard to any principle except principle 6 where an absolute limit of 17 hours work opportunity in 24 hours is applied. This outer limit is discussed further in Section 5.

8.4 Other Mitigating Strategies

A number of stakeholders have correctly identified that the RCS is limited in its consideration of factors that contribute to fatigue, focusing on those relating to scheduling of work and rest. It is acknowledged that other factors which can help mitigate fatigue risk, although ultimately sleep is required. The RCS attempts to balance the complexity of assessing fatigue risk with providing a tool that is relatively easy to use for operators and regulators. The inherent responsiveness of a performance based approach makes it is not only impossible but undesirable to attempt to define and quantify every possible mitigation or factor in fatigue assessment. The need to consider mitigations beyond those outlined in the RCS was envisaged by the IEP who stated that 'higher than the required AFM Standards in areas other than scheduling ... could be used as part of a fatigue risk-trade off.'⁹

One specific mitigation which has been proposed for consideration is use of telematics. The potential features of telematics include in-vehicle information and alerts to assist drivers in remaining compliant and back office systems which can support management in addressing any breaches in real time and utilising data to improve scheduling and rostering. The potential safety benefits of telematics have been addressed as part of the Electronic Work Diary (EWD) Pilot. Field trials and stakeholder engagement during this Pilot have identified the possible benefits of the technology, although there are a range of factors which can influence safety outcomes. Drew Dawson provided advice to the NTC as part of the EWD Pilot, indicating that telematics, when used as part of an integrated management system which includes real time monitoring and regular management reporting and monitoring, can

⁸ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 13

⁹ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 7

improve fatigue management and reduce overall systemic risk. The potential of telematics as part of a fatigue management system is accepted, however there is currently insufficient evidence of the safety and fatigue risk mitigation benefits of the technology to support the inclusion and scoring of this in the RCS. However, the NHVR acknowledges its potential and would support the inclusion of telematics use as part of an AFM application. Dependent on the findings of future research in the area, telematics could be considered for inclusion in future iterations of the RCS including assigning a relative score to the use of this equipment.

The frequency of access to higher risk work arrangements is a factor that would be considered in assessing an application. For some operators access to the outer limit of an approval is used only when unexpected events occur or for infrequent trips. It could be reasonably argued that in considering an application the highest risk elements are those that need to be assessed. It should be understood that it is not appropriate to allow an unacceptable safety risk regardless of the frequency. However in considering an application which has low frequency of higher risk work arrangements, the management of these infrequent events within an overall system is relevant.

Without limiting the variety of factors that could be put forward by an operator as part of a safety case the following are possible mitigations that could be considered:

- 24 hour control room that provides ready access for a driver to seek support and advice in the case of unexpected events which disrupt a schedule.
- In-vehicle fatigue monitoring devices and systems for managing triggers from these devices.
- telematics which is proactively used and monitored to manage fatigue compliance and to assist in scheduling. In-vehicle alerts including information to assist a driver to plan and schedule rest breaks is also available from some devices.
- higher quality sleeper berths (e.g. air conditioned, better noise and light proofing etc.).
- enhanced health screening including for instance drug testing; individual sleep pattern testing.
- frequency of accessing higher risk work arrangements.
- advanced procedures for checking fitness for work prior to and during a shift.

8.5 Enforcement

The enforcement of AFM under the RCS has been raised as an issue by some stakeholders. This concern appears to be based on the individual nature of the arrangements that may be approved under the RCS.

AFM as it currently operates is also based on individual approvals with a universal outer limit of 15 or 16 hours. Stakeholders advise that currently roadside enforcement practice focuses on the outer limit rather than the specifics of the AFM approval. More detailed review of compliance with AFM conditions is undertaken via back office auditing.

The revised AFM arrangements as proposed under the RCS also provide for an outer limit and as a consequence the complexity and appropriateness of roadside and back office enforcement will not change.

8.6 Flexibility and Administrative Efficiency

A number of industry stakeholders have commented that they believe the RCS and revised AFM arrangements provide:

- less flexibility than the previous scheme.
- no improvements in administrative efficiency.

The previous AFM was a performance based approach with an outer limit (either 15 hours or 16 hours of work). The proposed AFM arrangements remain a performance based approach with an outer limit of 17 hours work opportunity. Fundamentally therefore the only element that has changed is an adjustment to the outer limit. Transport Operators are still able to submit flexible work arrangements that cannot be accommodated under Standard Hours or BFM. As with the previous scheme, where an operator is able to work their desired work schedules under either Standard Hours or BFM they would be expected to utilise these schemes rather than applying for AFM (although there is nothing preventing them from doing so). The RCS provides a tool for assessing applications but does not impose any additional prescriptive limits, other than the outer limit, on applicants.

The previous AFM scheme was criticised because of factors relating to:

- the cost of preparing individual applications which generally required engagement of a fatigue expert.
- the assessment process through fap could be protracted, often because of fap members' concerns about the relative fatigue risk of a proposed scheme.
- the uncertainty of an application's outcome because of the lack of transparency of decision making criteria

The revised scheme is expected to provide administrative efficiencies through:

- use of the RCS on-line coaching tool by operators allowing them to 'self-score' and identifier higher risk elements of an application prior to lodging their submission with the NHVR. This will provide them with an indication of likelihood of a successful application and the ability to adjust their work arrangements to reduce overall fatigue likelihood and hence score prior to submission.
- use of published templates which will provide operators with much reduced effort in developing a proposal, relative confidence about receiving approval and a significantly reduced processing time by the NHVR, noting that operators will still need to demonstrate that they have the systems and processes in place to manage operations in accordance with the template.
- operator use of the RCS templates to assess their overall fatigue risk **likelihood** without engaging external fatigue experts. engagement of expert advice would only be



considered necessary if a high scoring work schedule was developed and the operator wished to present evidence of its relative fatigue risk.

- safety case guidelines to be developed by the NHVR providing operators with clear direction on the areas to be covered.
- performance timeframes built in to FERG terms of reference with focus on engagement by time and cost efficient mechanisms such as email and teleconference.
- use of the RCS template by the NHVR and FERG to consider fatigue likelihood, improving confidence in decision making which is expected to improve timeliness.

9 Prescriptive Approaches of Standard Hours and BFM compared to AFM

The management of fatigue is an inexact science and is a factor of a range of individual circumstances, work and personal activities and sleep and work patterns. It is therefore not possible to develop a set of rules which will guarantee safe, fatigue free driving.

The IEP noted that more work needed to be done before there could be confidence in the risk management system which underpins the health and safety approach to fatigue as the single approach to management of fatigue in the road transport industry. It stated that ‘an ideal system would always be a hybrid – that is, the regulation of fatigue in trucks must be a mixture of clear and agreed national limits backed by sensible and robust driver health and safety management and planning, effective oversight of operator risk management systems and robust on road enforcement.’¹⁰

In setting regulatory parameters around fatigue under the HVDF and HVNL, there have been three underpinning principles which attempt to balance prescriptive and performance based approaches to fatigue:

- setting of prescriptive limits based on assessment of work arrangements and rest opportunities most likely to support safe operations (enshrined in Standard Hours and BFM).
- providing a framework via AFM which allows for performance based approaches to fatigue management outside the schedule allowed under Standard hours and BFM.
- overarching requirement to not work when fatigued regardless of prescriptive limits or approved AFM schedules.

The prescriptive arrangements which apply to Standard Hours and BFM provide combinations of maximum limits on work and minimum amounts of rest over varying time periods. These rules and work combinations provide:

- assurance to the community that there is some limit placed on the fatigue risk of heavy vehicle operations; and
- provide direction to operators in the development of schedules in a manner that limits the potential for negative outcomes from driver fatigue.

AFM allows operators to develop fatigue management systems based on work and rest combinations not allowed under prescriptive Standard Hours and BFM, but which meet their operational requirements whilst still providing safe working arrangements. However, not all operators wish, or have the skill and capability, to provide the level of assurance and control required to manage fatigue risk in an AFM context and for these operators and their drivers a

¹⁰ Independent Expert Panel on Heavy Vehicle Policy Report 2011 p 4

prescriptive approach provides a set of safety boundaries within which to manage their schedules.

A number of stakeholders have highlighted that within the prescriptive limits of Standard Hours and BFM it is theoretically possible for an operator to develop work schedules, particularly those involving night work, which would be considered higher risk when assessed under the RCS. This has prompted some stakeholders to suggest that the AFM/RCS is too restrictive. The intention of AFM is not to provide access to inherently more risky work schedules than those available under BFM and Standard Hours; higher risk practices need to be offset by counter measures to bring risk down to an acceptable overall level – a level which IEP stated should be equivalent to that of Standard Hours.

Some stakeholders have suggested that Standard Hours should be viewed as a baseline, with AFM providing access to increased work hours. This is based on the assumption that operating within Standard Hours is analogous to working at low or no risk. This is not the case. There are elements of Standard Hours that are not low risk but may be lower risk in isolation. Working to the limits of Standard Hours still involves fatigue risk. Therefore, the relative combined worse case risks in Standard Hours is not a starting point from which AFM applications should build.

The revised arrangements for management of AFM within the RCS do not fundamentally change the performance based, rather than prescriptive focus of AFM, however provides some guidance to operators and regulators in assessing the level of risk of various combinations of work and sleep opportunities. The weighting and hence scoring provides an indication of the relative risk of particular scheduling arrangements but is not intended to be prescriptive or imply absolute limits. The only absolute limit applies to 17 hours work opportunity with a minimum of 1.5 hours rest in this period. This work opportunity must be bounded by at least 7 hours of opportunity for sleep.

Prescriptive regulation provides a series of limits and controls based on a standardised or average operation. These limits are designed to provide safety boundaries within which operators and drivers must manage their operations and fatigue levels. Risk based legislation acknowledges that it is possible to balance higher risk tasks with compensatory offsets to manage fatigue within a system of checks and balances which focus on managing overall fatigue risk rather than operating to rules. Therefore the fundamental approach to these two forms of regulation is different and the comparison of work arrangements between the two is essentially meaningless.

10 Driving versus Non-Driving Tasks

Several stakeholders have identified what they believe to be unintended outcomes of the inclusion of non-driving work time in the definition of work, particularly where driving time is a relatively small part of overall work. Two examples provided by stakeholders relate to tourist bus operators and emergency response teams in the power industry. While often working long shifts, the driving component may be limited to no more than 2-3h. For these operators, the classification of all working time as equal arguably produces an overestimate of fatigue related risk since the exposure to and likelihood of fatigue related error is potentially less than would be the case for someone who drove continuously.

The scientific evidence on this issue indicates that assessing the likelihood of fatigue should take into account the timing and duration of driving and non-driving tasks within the shift (Blanco et al., 2011). The literature has addressed this principle through the notion of 'time-on-task' as distinct from 'time-at-work'. Susceptibility to fatigue-related error increases for sustained attention tasks (e.g. driving) once the period of sustained attention exceeds ~2h. While the 2008 reforms recognise that mandated breaks reduce continuous 'time-on-task' changes in work task during work time can also reduce fatigue-related risk.

Research indicates that not counting non-driving activities under-estimates the likelihood of fatigue. Conversely classifying all working time equally results in the *potential* to over-estimate fatigue likelihood. Operators who believed the re-classification does not achieve the stated goal of the reforms, (i.e. a greater benefit from improved safety relative to the loss of operational effectiveness) can reasonably use the AFM policy mechanism to argue for why they might exceed specific threshold values for a single dimension of the working time arrangement.

Although it introduces a greater degree of complexity, the evidence suggests that the fatigue likelihood assessment should take into account the time spent driving, the time spent on non-driving activities as well as mandated breaks in determining the likely level of fatigue. This has been recognised in Principle 2 of the RCS which looks at the balance between driving and non-driving work.

It is recognised that some operators are seeking a more formal review of driving versus non-driving work time and its treatment as part of AFM as well as Standard Hours and BFM. The AFM scheme is to be evaluated 2 years from operation and as part of this review the continued suitability of the RCS, including the weighting given to driving and non-driving time, will be considered. The NTC is currently undertaking a review of Standard Hours and BFM and submissions on this matter may be brought forward as part of this activity.

11 Penalties

There are a range of breaches ranging from minor to critical for breaches of hours of work and rest as per the conditions of the AFM approval.

If the AFM conditions are breached then escalated risk contraventions may apply. These escalated provisions apply when:

- AFM conditions are breached (necessary pre-condition); **and**
- the escalated risk thresholds are also breached.

Escalated risk contraventions result in more severe penalties.

12 Evaluation of Revised AFM Arrangements

As with any new scheme or approach, there will be room for improvement based on lessons learned. The IEP panel forecast that regular reviews of the RCS would be required to ensure it delivered the anticipated benefits without compromising safety.

The revised AFM arrangements, utilising the RCS, are to be reviewed two years after commencement of operation. This does not imply that adjustments cannot be made to the scheme during this period.

Whilst the terms of reference for the review will be reviewed and finalised prior to commencement, the following areas are expected to be covered:

- Risk Classification Matrix
 - based on research conducted since the evidence statement and RCS were developed, should the RCS be reviewed or revised. This may include but not be limited to consideration of weighting and scoring, principles and the interaction between elements of the matrix.
 - based on research are there other factors such as alerting technology based on eye movements or telematics use that can be included within the RCS or more formally recognised in the assessment process.
- Administrative Efficiency
 - what is the experience of Operators and the NHVR of the application process and in particular has the aim of improvements in administrative efficiency over the previous scheme been achieved.
 - what is the experience of Operators with the use of the support tools (on line RCS matrix; guidelines) provided by the NHVR.
 - what are the timeframes and estimated cost for application development and processing and have these improved over the previous AFM scheme.
 - what is the comparative volume of applications and approvals under the revised scheme compared to the previous scheme.
- Transparency of Decision Making
 - what is the experience of Operators and Regulators in regard to the transparency of decision making and rationale for AFM outcomes.
 - based on a review of applications, FERG referrals and advice and NHVR decisions are decisions clearly explained and documented.
- FERG Operations
 - what is the experience of FERG members of the referral and advice process.

- what is the NHVR experience of the FERG referral process and the extent to which this has assisted in enabling informed decisions on AFM applications.
- to what extent is it evident in decision making that the FERG referral process has been used appropriately, as outlined in the AFM Policy and Business Rules.
- is the FERG referral threshold appropriate in identifying high risk work and rest arrangements that warrant input from an expert group.
- is the composition of the FERG appropriate for the task they are required to undertake.
- Templates
 - what is the experience of Operators and the NHVR in the use of templates as a tool to improve ease of access for Operators to appropriate work and rest arrangements.
 - are the additional templates that could be developed.
 - is the format and information of templates appropriate in providing guidance to Operators as part of the application process.
- Enforcement
 - what is the experience of enforcement personnel of on-road intercepts with an AFM accredited Operator.
 - what evidence is there that audits of operators are effectively monitoring and reviewing AFM work arrangements.
- Safety

It is recognised that in addition to the review areas outlined above, that a review of fatigue risk management performance and the fatigue and safety outcomes of AFM applicants could also be considered.

Such an evaluation would be expected to be undertaken over several years and involve substantial funding. The potential for a review of this type is most likely to be progressed through national research programs. Consideration of a review of this nature would be a matter for consideration across a range of government agencies and programs.

It has been proposed that AFM participants be asked to provide data on:

- insurance claims.
- all incidents involving property damage (over a certain value) or injury.

This data would provide an indication of the safety of AFM participants and may provide the basis for assessing whether more extensive safety research is, or is not, warranted. The willingness of AFM participants to provide this data on a periodic basis (eg: 6 monthly) will be progressed as part of implementation planning.



PO Box 492 Ph: 1300 MYNHVR (1300 696 487)
Fortitude Valley Fx: (07) 3309 8777
QLD 4006 Email: info@nhvr.gov.au

www.nhvr.gov.au