Submission No 26

INQUIRY INTO HEAVY VEHICLE SAFETY AND USE OF TECHNOLOGY TO IMPROVE ROAD SAFETY

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Mr Greg Alpin MP
Chair
Staystafe (Joint Standing Committee on Road Safety)

Dear Mr Alpin,

It is with pleasure that we submit a response to the New South Wales Inquiry into heavy vehicle safety and use of technology to improve road safety.

The response enclosed is focused on two distinct parts – how technology will/can improve road safety with specific reference to:

a. The management of heavy vehicle driver fatigue and other safety risks through in-vehicle technologies, including benefits, costs, availability and adoption by industry
b. The development of connected and automated vehicle technologies specific for the heavy vehicle industry and opportunities for further development in this space

These areas are particularly relevant to the Seeing Machines approach to technology development, underpinned by a strong stream of human factors science.

Seeing Machines is a world leader in computer vision technologies which enable machines to see, understand and assist people. The Company's machine learning vision platform delivers real-time understanding of drivers/operators through artificial intelligence analysis of heads, faces and eyes which monitor attention state including drowsiness and distraction.

I trust you find this information valuable and look forward to the outcomes of this worthy Inquiry.

Yours sincerely,

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Executive Chariman and Interim CEO

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SEEING MACHINES LIMITED

PARLIAMENT OF NEW SOUTH WALES INQUIRY INTO HEAVY VEHICLE SAFETY AND USE OF TECHNOLOGY TO IMPROVE ROAD SAFETY

a. The management of heavy vehicle driver fatigue and other safety risks through in-vehicle technologies, including benefits, costs, availability and adoption by industry

Both drowsy and distracted driving are risks to heavy vehicle driver and road user safety that can be addressed through the use of in-vehicle technologies.

Drowsy Driving

Inadequate sleep is a major health and safety hazard that costs the country $66 billion annually and contributes to the death of about 3,000 people a year. [1] The Sleep Health Foundation Report by Deloitte Access Economics estimates more than one Australian will die every day – 394 a year - from falling asleep at the wheel of a vehicle or from industrial accidents due to lack of sleep.

"For too many people, driving tired is a dangerously normal part of everyday life," Professor Hillman from the Sleep Foundation says. "This behaviour is causing crashes and costing lives. It's time we treated sleep deprivation like alcohol and regulated against it."

According to the World Health Organisation, road traffic deaths are a major public health problem globally, with over 1.3M people killed in road accidents each year.[2]

In Australia NTI National Truck Accident Research Centre estimates that 12.2% of Australian truck crashes in 2017 were fatigue related.

Driver drowsiness remains a significant contributing factor to road crashes worldwide. In The United States, the National Highway Traffic Safety Administration[3] estimated that there are 56,000 crashes each year in which drowsiness or fatigue was cited by police as a causal factor. These crashes lead to, on average, 40,000 non-fatal injuries and 1,550 fatalities per year.

Other reports suggest that fatigue is present in 15%-44% of crashes in Australia and the US[4]. Similar ranges of heavy vehicle crashes in Australia and Europe involve fatigue (18.6% - 30% of crashes).[5]

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[1] Sleep Health Foundation report by Deloitte Access Economics 2017 - Asleep on the Job: Counting the cost of poor sleep, 8 August 2017.
[2] "Global status report on road safety 2015" World Health Organisation

[3] The National Highway Traffic Safety Administration (1998)
[4] Tefft, 2012; Fletcher, Lars, & Zelinsky, 2003; Fuletra & Bosamiya, 2013; Tefft, 2014; Armstrong,et al., 2013; Wheaton et al., 2013.
[5] International Road Transport Union, 2007; Williamson & Friswell, 2013; National Truck Accident Research Centre, 2015

In 2009 in the United States 30,000 vehicle crashes resulting in injury were fatigue related.[6] Research investigating safety critical events and road accidents involving local/short-haul truck drivers in the US estimated that 20% of these events involved driver drowsiness as a serious contributing factor. [7]

In addition, commercial vehicle drivers who were fatigued or fell asleep were 21 times more likely to be involved in a fatal crash[8], and drowsiness levels were higher for those drivers found at-fault for safety-related driving events.

Drowsy driving therefore remains a significant safety issue and it is critically important to look at technological approaches to effectively address it.

Distracted Driving

Distraction is a similarly pervasive public health problem, accounting for some 21% of all crashes in Australia.[9] Although the majority of drivers believe that distracting behaviours have a negative impact on safety, drivers nevertheless report engaging in these behaviours on average once every six minutes[10].

Distraction is typically associated with decrements in a range of driving performance measures including: increased speed variance, more variable lane-keeping position, increased variability in steering angle, and time headway to a lead vehicle, slower brake onset, and an increase in the overall number of driving errors.[11]

There are many types of distractions that can lead to impaired driving. The distraction caused by mobile phones is a growing concern for road safety[12].

- Drivers using mobile phones are approximately 4 times more likely to be involved in a crash than drivers not using a mobile phone. Using a phone while driving slows reaction times (notably braking reaction time, but also reaction to traffic signals), and makes it difficult to keep in the correct lane, and to keep the correct following distances.
- Hands-free phones are not much safer than hand-held phone sets, and texting considerably increases the risk of a crash.

According to US National Highway Traffic Safety Administration[13],10 percent of fatal crashes, 15 percent of injury crashes, and 14 percent of all police-reported motor vehicle traffic crashes in 2015 in North America were reported as distraction-affected crashes.

Distraction based data is relatively scarce for the commercial/heavy vehicle sector around the world. One reason for this is that an accident cannot be attributed to use of device (eg. cell phone) unless witnessed by law enforcement. However, a report from 2009, based on a naturalistic road study conducted by Virginia Tech Transportation Institute, in response to a contract awarded by The Federal Motor Carrier Safety

[6] National Highway and Traffic Safety Administration, 2011.
[7] National Highway Traffic Safety Administration, 2009; see Duffy et al., 2015 for recent review.
[8] Bunn et al., 2005
[9] McEvoy, Stevenson, & Woodard., 2006.
[10] McEvoy et al., 2006; Young & Lenné, 2010
[11] Boer, Rakauskas, Ward, & Goodrich, 2005; Briggs, Hole, & Land, 2011; Chen & Chiuhsiang, 2011; Engström, Johansson, & Östlund, 2005; Horberry, Anderson, Regan, Triggs, & Brown, 2006.
[12] http://www.who.int/mediacentre/factsheets/fs358/en/ reviewed January 2018
[13] US Department of Transportation, National Highway Traffic Safety Administration, "Traffic Safety Facts Research Note", March 2017.

Administration to investigate driver distraction in commercial motor vehicle drivers, concluded that "the most risky behaviour identified was **text message on cell phone**, with a significant odds ratio of 23.2. This means that drivers who text message while driving were 23.2 times more likely to be involved in a safety-critical event, compared to a baseline epoch, than if they were not text messaging while driving." [14]

It is widely agreed given available data that distraction is a concern in all driving, including heavy vehicles. Mobile device use, while driving, is banned in most countries and indeed enforced at a company level in many commercial/heavy fleet organisations, but is that enough? Small distractions often lead to big disasters.

In-vehicle approaches to managing these risks in real-time

There are significant efforts worldwide devoted to establishing methods to measure these driver behavioural states and to manage the associated risks in real-time that we have described[15]. These approaches broadly fall into three categories.

- The first approach uses exterior forward-facing sensing to detect safety-critical events. These typically use Advanced Driver Assistance Systems (ADAS) related to headway and lane departure warnings. While these are important safety events to manage, they are indirect or surrogate measures of the behaviours typically linked to rear-end crashes in the case of distraction and lane departure crashes in the case of drowsiness.
- The second approach uses driver inputs to identify potential risks. For example, most telematics systems will measure hard braking and steering events, while human factors research continues to examine the potential for vehicle measures to be good predictors of risk[16].
- The third category uses measures related to head pose, gaze and eyelid behaviour to assess the state of the driver. The latter class are typically referred to as driver monitoring systems (DMS).

A potential advantage of the latter class, DMS, relates to specificity – namely that is it possible to identify the driver state (distraction, drowsiness) through analysis of head and eye metrics. Regulators and fleet operators need to know the root cause of any safety events so they can manage the source conditions and prevent these safety events from happening again, and more importantly, from occurring in the first instance. DMS achieved via driver-facing cameras can achieve this. It is well established that a key indicator of driver drowsiness is changes in eyelid behaviour and/or head pose [10]. Further, distraction-related crashes typically involve the driver engaging in secondary activities including phone use or interactions with an infotainment system. Signs of drowsiness, evidenced through microsleep events, and distraction, evidenced through visual attention being directed off-road, can be captured via DMS and used by fleets to manage safety in real-time.

Driver monitoring technology for off-road/mining industry was introduced by Seeing Machines in 2007 and subsequently modified for use in commercial vehicles worldwide to tackle risks associated with long-haul driving. Caterpillar Inc., distributes the Seeing Machines driver monitoring technology for heavy vehicles through their global dealer network. Tim Crane, Caterpillar Services General Manager recently commented

[14] Olson, R.L., Hanowski, R.J., Hickman, J.S., Bocanegra, J., 2009. Driver Distraction in Commercial Vehicle Operations. Virginia Tech Transportation Institute, Department of Transportation, Blacksburg, VA.
[15] Lenné, M. G., Kuo, J., Fitzharris, M., Horberry, T., Mulvihill, C., Blay, K., Riquelme, N., Wood, D. & Peden, M. (submitted). The Advanced Safe Truck Concept Project: A partnership program developing future integrated driver monitoring technology. Paper submitted to the 25th ITS World Congress, Copenhagen, Denmark, 17-21 September 2018.

[16] Lenné MG, Jacobs EE. Predicting drowsiness-related driving events: a review of recent research methods and future opportunities. Theor Issues Ergon Sci. 2016;17(5–6):533–553.

on the effectiveness of driver monitoring technology in the mining sector as being able to 'measure the invisible risk', referring to drowsiness or fatigue-affected heavy vehicle operators.

This technology has been a source of data - in relation to drowsiness - installed within truck cabins, employing a global shutter image sensor and a pair of pulsed infrared lights to obtain images of the face and eyes of drivers in nearly all daytime and night-time conditions. The camera is placed upon a truck dashboard either directly in front of a driver, or to within a 30-degree angle to the left or right of their forward view direction.

The system is primarily designed to identify driver distraction events and impairment due to fatigue, which in turn offers the potential for significant safety benefits. To do this the system can be configured to alert the driver in real-time in the cabin (in this case the effects of auditory and vibration warnings issued in real-time to the driver) and which generates events which are also sent to a monitoring centre over a wireless network.

In most system configurations the monitoring centre expert notifies the company of the fatigue event, and an advisory communication by the company to the driver takes place.

The efficacy of this technology in operational fleets has been recently reported. One study used data from three medium-sized long-haul transport companies in South Africa[17]. Each of the three companies operates inter-city corridor trucking routes that involve driving a vehicle for between 10-12 hours per day. The trucks were fitted with the Seeing Machines Guardian solution, 49 trucks being including in the analysis. In this study a baseline refers to the period of time where the driver monitoring technology was fitted in the trucks and was logging data, but not providing any alerts to the driver. The 'intervention period' refers to the time at which the drivers were provided with alerts and the company feedback mechanism was in place. Across the three companies, data were available for a combined 380 days of operation between 1 January 2015 and 29 May 2015. For analyses by both distance travelled and hours driven there was over 90% reduction in the rate of fatigue events in the intervention period when the technology provided alerts to the driver and the company. Expressed another way, for distance travelled fatigue events occurred at 11-times higher rate in the baseline period than in the intervention period.

The contribution of the two feedback mechanisms, in-cab driver feedback and feedback to the company, were subsequently explored further in an Australian fleet from 2011-2015[18]. Relative to no feedback being provided to drivers when fatigue events were detected, in-cab warnings resulted in a 66% reduction in fatigue events, with a 95% reduction achieved by the real-time provision of direct feedback in addition to in-cab warnings. With feedback, fatigue events were shorter in duration and occurred later in the trip, and fewer drivers had more than one verified fatigue event per trip. While alerts to the driver alone were associated with a 66% reduction in drowsiness events, only when combined with feedback to the driver's employer was a 94% reduction found.

We are committed to continuously improving our technology to meet the future needs of the heavy vehicle industry. To this end, Seeing Machines is leading the first industry led Cooperative Research Centre Project funded Advanced Safe Truck Concept (A$6.5m project value over 3 years) in partnership with Monash University Accident Research Centre (MUARC), Ron Finemore Transport and Volvo Trucks Australia.

This ground-breaking project is a world first using driver monitoring technology and reflects the Australian Governments' recognition for ongoing development and the need to collect reliable and real-world data to

[17] Lenné, M. G. & Fitzharris, M. (2016). Real-time feedback reduces the incidence of fatigue events in heavy vehicle fleets. Proceedings of The 23rd ITS World Congress, Melbourne, Australia, 10–14 October 2016.
[18] Fitzharris, M., Liu, S., Stephens, A. N. & Lenné, M. G. (2017). The relative importance of real-time in-cab and external feedback in managing fatigue in real-world commercial transport operations. Traffic Injury Prevention, 18, S71-S78.

enhance road safety with improved technology. The two-phase program will test car and truck drivers in MUARC's Advanced Driving Simulators, and in a naturalistic on-road study using Volvo trucks in the Ron Finemore Transport fleet.

The proposed data gathering, using both driving simulation and on-road measurements, will help to refine current sensing, develop algorithms for new state sensing such as cognitive distraction and workload, and apply the latest thinking around the design of the human machine interface. The improved technology solutions for commercial/heavy vehicles resulting from this key data set will improve driver and operator safety, and play an important role in the overall safety of Australian roads more broadly.

Availability and adoption by the industry

The Seeing Machines driver monitoring technology has been adopted by over 200 commercial fleets worldwide and this continues to grow as commercial fleet providers focus on safety strategies to keep their drivers, and the communities within which they drive, safer.

Unique in that it provides real-time intervention, this technology, importantly, is also readily integrated with various telematics solutions worldwide to enable seamless access to driver data without having to access an alternate or additional interface.

More and more, fleets around the world are considering the adoption of camera-based technology to understand and manage driver behaviour. A large proportion of the technology available provides camera based recording and is used to coach drivers or understand events that may have led to an accident. The majority do not, however, provide real-time intervention based on detection of fatigue or distraction related driver event. Generally, benefits are associated with GPS tracking, speed detection, accelerometer, 3G connectivity, black box capability and so on.

The wider adoption of this technology has the potential to offer significant economic and productivity gains to the industry and the community more broadly. The Bureau of Infrastructure, Transport and Regional Economics (BITRE) in 2009 estimated that the costs of human losses in road crashes were approximately $2.4 million per fatality, $3.82 million for a person suffering profound impairment, and $1.78 million for a person suffering losses due to a severe impairment.[19] Aside from the horrific personal and family trauma, these costs are substantive.

When compared to A$800 per vehicle per year – the average cost to adopt driver monitoring technology that provides event detection and intervention in real-time, in an Australian fleet – the benefits associated with this technology as a safety gain are undeniable.

Driver Monitoring - Regulatory trends in Automotive Industry

Driver Monitoring Systems (DMS) technology is becoming a core element in the next generation of intelligent vehicles to augment drivers, enable better and safer driving, as well as underpin the safe migration to Highly Autonomous Vehicles (HAV).

Automotive and transport regulatory, rating and investigative bodies around the world have begun to issue

[19] Bureau of Infrastructure, Transport and Regional Economics [BITRE]. (2009). Road crash costs in Australia 2006, Report 118, Canberra.

new recommendations and mandates for DMS as an integral part of new vehicle designs including those with Advanced Driver Assistance Systems (ADAS). These bodies are variously encouraging and requiring deployment of advancing DMS technology to deal with the deadly threat of driver distraction and fatigue, as well as mitigation of the risks associated with the migration toward HAV. Effective DMS is being identified as essential to a safe "co-pilot" functionality in HAVs to ensure that drivers remain sufficiently engaged and/or ready to re-assume control as and when required.

In 2016, a report commissioned by the European Commission into Advanced Driver Assistance Systems concluded "Since driver behavior can modify the performance of safety systems which aims for crash avoidance, assessment of the human-machine interface, while complex, is essential."[20]

In September 2017, Euro NCAP (European body responsible for vehicle safety ratings and testing) unveiled its "Pursuit of Vision Zero" Roadmap 2025, with the goal of zero automotive accidents. It identified Driver Monitoring as a primary safety feature, required by 2020 for ANY new on-road vehicles to achieve a full safety rating. Euro NCAP will require "driver monitoring systems that effectively detect impaired and distracted driving and give appropriate warning and take effective action". The roadmap goes further in stating that existing ADAS safety systems can be enhanced by adapting intervention criteria specifically to the driver's dynamic state and further stated that even though it has yet to publish its full guidelines for HAV ratings, DMS will be required there also.

Recently the US National Transportation Safety Board (NTSB) published its investigation report on a fatal accident involving a leading semi-autonomous vehicle with "Autopilot" mode engaged, which concluded that overreliance on the feature and prolonged driver disengagement from the driving task contributed to the accident. Several specific safety recommendations were issued in NTSB's report[21], for design of semi-autonomous vehicles, including the adoption of more effective monitoring of driver attention, commensurate with the capability level of the automated driving system. This included a specific safety recommendation to manufacturers of Level 2 capable vehicles to: "Develop applications to more effectively sense the driver's level of engagement and alert the driver when engagement is lacking while automated vehicle control systems are in use." [22]

We believe, given the impact that a single heavy vehicle accident can have on the surrounding community, it is only a matter of time before governments and regulatory bodies around the world begin to mandate more safety measures that include the adoption of camera-based driver monitoring. It is particularly important as the field of intelligent vehicles grows rapidly globally, encompassing automotive, truck, public transport, industrial and military sectors. Driver monitoring technology for heavy vehicle operators presents a clear opportunity for NSW Government to take a leadership position as part of the overall road safety strategy of reducing road trauma across the State.

[20] European Commission, Advanced driver assistance systems, European Commission, Directorate General for Transport, November 2016.
[21] National Transportation Safety Board "Collision Between a Car Operating with Automated Vehicle Control Systems and a Tractor-Semitrailer Truck Near Williston, Florida, May 7, 2016
[22] National Transportation Safety Board Public Meeting of September 12, 2017

b. The development of connected and automated vehicle technologies specific for the heavy vehicle industry and opportunities for further development in this space

There is a global OEM (Original Equipment Manufacturer) push to explore the application of automated vehicle technologies. Until fully automated and genuinely driverless vehicles are available there is recognition within industry that it is critical for the vehicle to know the state of the driver. In passenger fleets the applications are initially focussed on partial automation such as systems offered by Tesla and General Motors.

General Motors recently launched their 2018 Cadillac CT6 Super Cruise in 2017 across the US, representing the world's first true hands-free driving system for the highway.

Overcoming the challenges of reliable driver monitoring is critical in semi-autonomous driving systems to address the need for keeping drivers engaged and prepared to re-take control of the vehicle when required. The Cadillac Super Cruise system uses Seeing Machines driver monitoring technology to enable a gumdrop-sized infrared camera on the steering wheel column to accurately determine the driver's attention state. This is accomplished through a precise measure of head orientation and eyelid movements under a full range of daytime and night-time driving conditions. If the driver looks away from the road or closes their eyes for more than a few seconds, a light bar integrated into the steering wheel will flash to guide the driver's attention back to the road. If the system determines that the driver is continuing to ignore the road, intentionally or otherwise, a series of escalating visual, audible, seat vibration alerts are employed. This is followed, eventually, by an automatic safe stop of the vehicle if the driver does not, or cannot, return their attention to the road. DMS technology allows the vehicle to make a smarter decision on when to make particular features available (or not) to the driver and when to intervene when the driver is not able to.

There are varied views on when we will see mass deployment of autonomous vehicles on our roads. Depending on whose view one takes, it could be anywhere from four to twenty-four years before full autonomy is a reality for car owners. But, as with all technology, as it evolves, major change occurs and driver monitoring technology is a critical new market solution for overcoming the safety challenges associated with the safe use of level-2 and level-3 conditionally-autonomous driving technology – that of keeping drivers engaged and ready to regain control of the car whenever required.

As previously mentioned, automotive regulatory bodies have begun to include driver monitoring technology as a recommended mandate as part of their roadmap to improve safety in vehicles (one of many recommendations and levels of commitment to this vary from jurisdiction to jurisdiction) and will use this technology to enhance a manufacturers' safety rating.

Moving to the heavy vehicle industry, mining engineers have been experimenting with autonomous equipment since the1990s. While it has taken some time for the technology to be available, large global off-road equipment manufacturers do sell autonomous mining trucks, used at various sites around the globe.

The obvious advantage of this is that autonomous trucks are able to drive an exact route every time without getting bored, tired, or taking time off. This eliminates human error and increases a mine's productivity.

However, this technology is not so easily applied to roads and highways around the world where there are many more factors to consider. Not that this has stopped companies like Tesla, Waymo and Embark in the US from developing the robo-truck.

In fact, since early October, autonomous trucks built and operated by the startup Embark have been hauling Frigidaire refrigerators 650 miles along the I-10 freeway, from a warehouse in El Paso, Texas, to a distribution center in Palm Springs, California. A human driver rides in the cab to monitor the computer chauffeur for now, but the ultimate goal of this (auto) pilot program is to dump the fleshbag and let the trucks rumble solo down the highway.[23]

The American Trucking Association is keen to embrace the technology but regulation around these vehicles remains unclear, around the world. Obvious objections to the technology and development of federal legislation come from organisations like The International Brotherhood Teamsters – world's biggest labour union.

"We continue to believe that the automated technologies being developed today will assist drivers, improving safety and productivity, and that the job of truck driver will be with us for the foreseeable future," Chris Spear, the president and CEO of the American Trucking Associations, told the Senate in 2017.

The startup Peloton, is working on "platooning" trucks, or groups of vehicles that communicate via a wireless connection that helps them time their movements. At some point soon, the system might let a lead driver take over the steering for a bit, while those at the wheels in the vehicles behind could snooze, catch up on paperwork, meditate, whatever. California-based Embark would like to see driver-monitored trucks pilot themselves on interstates but be manually driven into warehouses by nimbler humans. Starsky Robotics has a similar vision, but says that the trickier driving manoeuvres could be done by a human in a remote location, Predator drone-style. It's unclear if any of these companies want—or will be able—to ever take the human out of the picture entirely.[24]

While we cannot be clear about how the heavy vehicle industry regulators will react, we do know that there is a very strong interest at a number of levels (OEM and regulatory) in having the vehicle know the state of the driver to guide the technology and any regulatory implications.

[23] https://www.wired.com/story/embark-self-driving-truck-deliveries/
[24] https://www.wired.com/story/trucks-robocar-senate-war/

FINAL REMARK

Seeing Machines has been championing driver monitoring technology as a safety and behavioural management tool across transport sectors for over ten years. As mentioned, our worldwide experience in the mining and commercial vehicle sectors positions the company very well to inform regulatory and government on the implementation of technology as a safety measure across New South Wales and more broadly. Additionally, the Seeing Machines approach to human factors science is underpinned by real-world data collection and in-vehicle experience and enables us to develop applicable and non-intrusive technology that we know will achieve the desired outcomes when applied to real-world settings – that being to save lives.

A recap on key themes:

- Fatigued/drowsy and distracted driving are widely accepted as current known risks. As vehicles become more intelligent with technology developments, there will be increased need to understand the behavioural state of the driver. Camera based driver monitoring is an effective way to measure driver state and to manage it through provision of warnings to ensure they are engaged in the task of driving, when they need to be.
- Driver monitoring technology has already been widely accepted and adopted as an after-market solution both in commercial/heavy vehicles as well as industrial vehicles, and is established as a safety tool within the industry enables industries to implement mature fatigue management plans.
- As autonomous driving technologies mature, the heavy vehicle manufacturers are engaged in deploying this technology into trucks, especially as the cost of these technologies lowers and fleet and social acceptance increases. Rather than dealing with fleets that choose to adopt the after-market version, this technology will continue to become more and more widespread, leading to increased risk areas for governments and regulators to consider.
- The average cost to adopt driver monitoring technology that provides event detection and intervention in real-time, in an Australian fleet is around A$800 per vehicle per year. The benefits associated with this technology as a safety gain are undeniable, especially when compared with the crippling costs associated with one heavy vehicle accident.

By supporting this Australian made technology the NSW Government would be at the forefront of road safety improvement. We believe that an industry-led subsidy where government, regulatory bodies and/or insurance companies provided up to 50% rebate on the annual cost per vehicle for a designated timeframe (eg. 5 years), would remove cost barriers for many small to medium enterprises and result in a significant increased uptake of driver monitoring as a safety technology.

According to the Australian Bureau of Statistics, over 95 percent of trucking businesses in Australia have less than 20 employees[25], and are classified as small enterprise, where additional costs to the business could be perceived to be an additional and unwanted burden. This leadership would doubtless make a very positive impact on commercial vehicle driver behavior and has been proven to reduce fatigue and distracted driver related events by upwards of 90%.

[25] Australian Bureau of Statistics, 8165.0 - Counts of Australian Businesses, including Entries and Exits, Jun 2012 to Jun 2016.